Opasraportti

FTech - Industrial Engineering and Management (2019 - 2020)

Tutkintorakenteet

Master of Science in Technology, Industrial Engineering and Management/ Production Management

Tutkintorakenteen tila: published

Lukuvuosi: 2019-20

Lukuvuoden alkamispäivämäärä: 01.08.2019

MAJOR STUDIES: 40 ECTS cr (40 op)

555307M: Common Studies of the Majors in other Universities /Institutes, 0 - 30 op
A440231: Major Studies, Production Management, 40 op
Compulsory
555313S: Management, 5 op
555314S: Management Information Systems, 5 op
555301S: Research Seminar, 5 op
555304S: Advanced Internship, 5 op
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op

SUPPLEMENTARY MODULE 1: Supplementary studies, 20 ECTS cr (vähintään 20 op)

The total extent of the major studies and the supplementary module 1 should be at least 60 ECTS cr.

1. Select one of the modules 11 - 13. The instruction language in the module 13 is Finnish. The courses in a module are compulsory. If you want to choose only one course from a module, you can include it in **elective advanced studies (check next point, 2).**
2. Fill the modules with elective **advanced** studies (the list is included in the modules) so that the total extend of the major studies is at least 60 ECTS cr.

Module 11: Organisation and knowledge management

A440259: Complementary Study Module of the Major/ Organization and Knowledge management, Advanced Module, 10 op
Obligatory studies of Organisation and knowledge management
555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op

Elective advanced studies
555376S: Sustainable organisational development, 5 op
555377S: Risk Management, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op
555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op
Project Management
555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op
Process and Quality Management
555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op
Product Management
555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op
Production Management
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op

Module 12: Project Management

A440260: Complementary Study Module of the Major/ Project Management, Advanced Module, 10 op
Obligatory studies of Project Management
555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op
Elective advanced studies
555376S: Sustainable organisational development, 5 op
555377S: Risk Management, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op
555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op
Organisation and knowledge management
555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op
Process and Quality Management
555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op
Product Management
555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op
Production Management
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op

Module 13: Process and Quality Management

A440261: Complementary Study Module of the Major/ Process and Quality Management, Advanced Module, 15 op
Obligatory studies of Process and Quality Management
555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op
Elective advanced studies
555376S: Sustainable organisational development, 5 op
555377S: Risk Management, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op

Project Management

555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op

Organisation and knowledge management

555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op

Production Management

555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op

Product Management

555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op

SUPPLEMENTARY MODULE 2: Engineering and other IEM studies, 20 ECTS cr (vähintään 20 op)

Master's Programme student (2 year education) should select 'other IEM' studies.

Degree Programme student (5 year education) should select 'engineering' studies.

Other Industrial Engineering and Management Studies

A440270: Complementary Module, Other Industrial Engineering and Management Studies, 20 - 30 op

Elective studies (max 10 cr)

555226A: Operations and supply chain management, 5 op
555242A: Product development, 5 op
555264P: Managing well-being and quality of working life, 5 op
555285A: Project management, 5 op
555286A: Process and quality management, 5 op

Elective advanced studies

555377S: Risk Management, 5 op
555376S: Sustainable organisational development, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op
555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Project Management

555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op

Organization and knowledge management

555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op

Process and Quality Management

555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op

Product Management

555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op

Production Management

555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op

lectronics and Communications Engineering (previous Electrical Engineering)

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

A440253: Supplementary Module, Electronics and Communications Engineering, 20 - 30 op

Electronics

521432A: Electronics Design I, 5 op
521070A: Introduction to Microfabrication Techniques, 5 op
521404A: Digital Techniques 2, 5 op
521307A: Laboratory Exercises on Analogue Electronics, 5 op
521075S: Microelectronics Packaging Technologies, 5 op
521089S: Printed Electronics, 5 op
521098S: Testing Techniques of Electronics and Printed Electronics, 5 op

Wireless communication engineering

521303A: Circuit Theory 2, 5 op
521384A: Basics in Radio Engineering, 5 op
521304A: Filters, 5 op
521395S: Wireless Communications I, 5 op
521340S: Communications Networks I, 5 op
521349S: Wireless Communications II, 5 op

Biomedical engineering (previous Medical and Wellness Technology)

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440265: Complementary Module, Medical and Wellness Technology, 20 - 30 op

Electives

764327A: Virtual measurement environments, 5 op
521273S: Biosignal Processing I, 5 op
080929S: Health Technology and Multimodal Monitoring, 5 op
521097S: Wireless Measurements, 5 op
080916S: Biomechanics of Human Movement, 5 op
521093S: Biomedical Instrumentation, 5 op
080927S: Connected Health and mHealth, 5 op

Software Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440266: Complementary Module, Software Engineering, 20 - 30 op

Common studies

811372A: Software Development, Maintenance and Operations, 5 op

Software Production

811373A: Professional Software Engineering Processes and Human Factors, 5 op
812331A: Interaction Design, 5 op
521041A: Applied Computing Project I, 8 op
817602S: Software Development in Global Environment, 5 op
815662S: Software Engineering Management, Measurement and Improvement, 5 op
521156S: Towards Data Mining, 5 op

Information systems

813623S: Information Security Policy and Management in Organisations, 5 op
521453A: Operating Systems, 5 op
811312A: Data Structures and Algorithms, 5 op

Information Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440267: Complementary Module, Information Engineering, 20 - 30 op

Artificial Intelligence

521156S: Towards Data Mining, 5 op
521289S: Machine Learning, 5 op
521283S: Big Data Processing and Applications, 5 op
811168P: Information Security, 5 op

Computer Science

521453A: Operating Systems, 5 op
031023P: Mathematical Structures for Computer Science, 5 op
521286A: Computer Systems, 8 op
521043S: Internet of Things, 5 op
521348S: Statistical Signal Processing 1, 5 op

Mining Technology and Mineral Processing

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440264: Complementary Module, Mining Technology and Mineral Processing, 20 - 30 op
Electives
493300A: Principles of mineral processing, 5 op
493302A: Chemical phenomena in mineral processes, 5 op
772335A: Introduction to ore mineralogy, 5 op
493605S: Ore benefication technologies, 5 op

Mechanical Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440255: Supplementary Module, Mechanical Engineering, 20 - 30 op
Common courses
462107A: Maintenance of machines, 5 op
462109S: Simulation and modelling of machines, 8 op
521043S: Internet of Things, 5 op
Machine Design
462103A: Introduction to Maintenance, 5 op
462101A: Information technology and machines, 5 op
462102A: Machine automation actuators, 5 op
464105S: Computer aided design, 5 op
462105A: Machine Sensor Technology, 5 op
462111S: Machine diagnostics, 10 op
Mechatronics
521077P: Introduction to Electronics, 5 op
521302A: Circuit Theory 1, 5 op
461106A: Dynamics, 5 op
462110S: Advanced course in mechatronics, 8 op
521160P: Introduction to Artificial Intelligence, 5 op
Production engineering
462104A: Machine automation, 5 op
463104A: Advanced manufacturing methods, 7 op
463109S: Computer aided manufacturing, 7 op

Process Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440249: Supplementary Module, Process Engineering, 20 - 30 op
Process engineering
477304A: Separation Processes, 5 op
477203A: Process Design, 5 op
477309S: Process and Environmental Catalysis, 5 op
477204S: Chemical Engineering Thermodynamics, 5 op
Process Engineering B
477123S: Chemical processing of biomasses, 5 op
477124S: Mechanical processing of biomasses, 5 op
477126S: Manufacturing of fibre products, 5 op
477128S: Circular Bioeconomy, 5 op
Autumation engineering
477621A: Control System Analysis, 5 op
477622A: Control System Design, 5 op
477524S: Process Optimization, 5 op
477624S: Control System Methods, 5 op

Civil and Construction Engineering (previous Civil Engineering)

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440263: Complementary Module, Civil Engineering, 20 - 30 op
Structural Engineering
485109A: Numerical methods in structural engineering, 5 op

466107S: Design of concrete structures, 6 op
485108A: Desing of Steel Structures and Steel Construction, 5 op
485107A: Timber construction and product technology, 5 op
Traffic and road construction engineering
485401A: Basics of Traffic Engineering, 5 op
485402S: Advanced Course in Traffic Engineering, 5 op
485403A: Basics of Road Engineering, 5 op
485404S: Road Design and Construction, 5 op

Environmental Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440256: Supplementary Module, Environmental Engineering, 20 - 30 op
Enviromental Engineering A
488209S: Renewable Energy, 5 op
488501S: Smart Grid I: Integrating renewable energy sources, 5 op
488502S: Smart Grid II: Smart buildings/smart customers in the smart grid, 5 op
488503S: Smart Grid III: Smart energy networks, 5 op
Enviromental engineering B
477309S: Process and Environmental Catalysis, 5 op
488203S: Industrial Ecology, 5 op
488214S: Air Pollution Control Engineering - Practical Solutions, 5 op
488215S: Industry and Environment, 5 op
Environmental engineering C
488110S: Water and Wastewater Treatment, 5 op
488134S: Hydrogeology and groundwater engineering, 5 op
488135S: Water distribution and sewage networks, 5 op
488206S: Sustainable Energy Project, 5 op

Other engineering module

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

ELECTIVE STUDIES, 0 - 10 ECTS cr (enintään 10 op)

If the minimum of the degree’s courses of 90 ECTS cr is not completed, you can complete the degree with elective studies. The courses 555212P Orientation Course for New Students, 030008P Information Skills for Foreign Degree Students and 900017Y Survival Finnish Course are compulsory for new International Master's Program students. Also studies in language -, business or entrepreunership are recomended. For IMP's students Finnish language studies are recommended. More information can be found in WebOodi's course catalogues (example Oulu Business School and Extension School).

555306M: Elective Studies in other Universities /Institutes, 0 - 30 op
A440269: Special Module, 0 - 10 op
International students should select 555212P, 030008P and 900017Y
555212P: Orientation Course for New Students, 1 op
030005P: Information Skills, 1 op
030008P: Information Skills for foreign degree students, 1 op
900017Y: Survival Finnish, 2 op
Recommended studies
555214A: Working in the university community, 5 op
555215A: Working life project, 5 op
555310S: Demola Project, 5 op

MASTER'S THESIS and related Studies, 30 ECTS cr (30 op)

555300S: Master's Thesis, 30 op
555302S: Maturity Test / Master of Science in Industrial Engineering and Management, 0 op

Master of Science in Technology, Industrial Engineering and Management/ Product Management

Tutkintorakenteen tila: published

Lukuvuosi: 2019-20

Lukuvuoden alkamispäivämäärä: 01.08.2019

MAJOR STUDIES: 40 ECTS cr (40 op)

555307M: Common Studies of the Majors in other Universities /Institutes, 0 - 30 op
A440230: Major Studies, Product Management, 40 op
Compulsory
555313S: Management, 5 op
555314S: Management Information Systems, 5 op
555301S: Research Seminar, 5 op
555304S: Advanced Internship, 5 op
555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op

SUPPLEMENTARY MODULE 1: Supplementary studies, 20 ECTS cr (vähintään 20 op)

The total extent of the major studies and the supplementary module 1 should be at least 60 ECTS cr.

1. Select one of the modules 11 - 13. The instruction language in the module 13 is Finnish. The courses in a module are compulsory. If you want to choose only one course from a module, you can include it in **elective advanced studies (check next point, 2).**
2. Fill the modules with elective **advanced** studies (the list is included in the modules) so that the total extend of the major studies is at least 60 ECTS cr.

Module 11: Organisation and knowledge management

A440259: Complementary Study Module of the Major/ Organization and Knowledge management, Advanced Module, 10 op
Obligatory studies of Organisation and knowledge management
555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op
Elective advanced studies
555376S: Sustainable organisational development, 5 op
555377S: Risk Management, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op
555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op
Project Management
555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op
Process and Quality Management
555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op
Product Management
555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op
Production Management
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op

555332S: Operations Research, 5 op
555333S: Production Management, 5 op

Module 12: Project Management

A440260: Complementary Study Module of the Major/ Project Management, Advanced Module, 10 op
Obligatory studies of Project Management
555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op
Elective advanced studies
555376S: Sustainable organisational development, 5 op
555377S: Risk Management, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op
555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op
Organisation and knowledge management
555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op
Process and Quality Management
555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op
Product Management
555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op
Production Management
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op

Module 13: Process and Quality Management

A440261: Complementary Study Module of the Major/ Process and Quality Management, Advanced Module, 15 op
Obligatory studies of Process and Quality Management
555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op
Elective advanced studies
555376S: Sustainable organisational development, 5 op
555377S: Risk Management, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op
Project Management
555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op
Organisation and knowledge management
555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op
Production Management
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op
Product Management
555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op

SUPPLEMENTARY MODULE 2: Engineering and other IEM studies, 20 ECTS cr (vähintään 20 op)

Master's Programme student (2 year education) should select 'other IEM' studies.

Degree Programme student (5 year education) should select 'engineering' studies.

Other Industrial Engineering and Management Studies

A440270: Complementary Module, Other Industrial Engineering and Management Studies, 20 - 30 op
Elective studies (max 10 cr)
555226A: Operations and supply chain management, 5 op
555242A: Product development, 5 op
555264P: Managing well-being and quality of working life, 5 op
555285A: Project management, 5 op
555286A: Process and quality management, 5 op
Elective advanced studies
555377S: Risk Management, 5 op
555376S: Sustainable organisational development, 5 op
555378S: Seminar in industrial engineering and management, 5 op
555379S: Research Project in Industrial Engineering and Management, 5 op
555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
Project Management
555391S: Advanced Course in Project Management, 5 op
555382S: Management of a project-based firm, 5 op
Organization and knowledge management
555370S: Strategic Management, 5 op
555371S: Human Resource Management, 5 op
Process and Quality Management
555390S: Process Analytics, 5 op
555389S: Systematic Process Improvement, 10 op
Product Management
555350S: Research and Technology Management, 5 op
555351S: Advanced Course in Product Development, 5 op
555343S: Product Data and product life cycle management, 5 op
555346S: Product portfolio management, 5 op
Production Management
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555332S: Operations Research, 5 op
555333S: Production Management, 5 op

lectronics and Communications Engineering (previous Electrical Engineering)

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440253: Supplementary Module, Electronics and Communications Engineering, 20 - 30 op
Electronics
521432A: Electronics Design I, 5 op
521070A: Introduction to Microfabrication Techniques, 5 op
521404A: Digital Techniques 2, 5 op
521307A: Laboratory Exercises on Analogue Electronics, 5 op
521075S: Microelectronics Packaging Technologies, 5 op
521089S: Printed Electronics, 5 op
521098S: Testing Techniques of Electronics and Printed Electronics, 5 op
Wireless communication engineering
521303A: Circuit Theory 2, 5 op
521384A: Basics in Radio Engineering, 5 op
521304A: Filters, 5 op
521395S: Wireless Communications I, 5 op
521340S: Communications Networks I, 5 op
521349S: Wireless Communications II, 5 op

Biomedical engineering (previous Medical and Wellness Technology)

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440265: Complementary Module, Medical and Wellness Technology, 20 - 30 op

Electives

764327A: Virtual measurement environments, 5 op
521273S: Biosignal Processing I, 5 op
080929S: Health Technology and Multimodal Monitoring, 5 op
521097S: Wireless Measurements, 5 op
080916S: Biomechanics of Human Movement, 5 op
521093S: Biomedical Instrumentation, 5 op
080927S: Connected Health and mHealth, 5 op

Software Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440266: Complementary Module, Software Engineering, 20 - 30 op

Common studies

811372A: Software Development, Maintenance and Operations, 5 op

Software Production

811373A: Professional Software Engineering Processes and Human Factors, 5 op
812331A: Interaction Design, 5 op
521041A: Applied Computing Project I, 8 op
817602S: Software Development in Global Environment, 5 op
815662S: Software Engineering Management, Measurement and Improvement, 5 op
521156S: Towards Data Mining, 5 op

Information systems

813623S: Information Security Policy and Management in Organisations, 5 op
521453A: Operating Systems, 5 op
811312A: Data Structures and Algorithms, 5 op

Information Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440267: Complementary Module, Information Engineering, 20 - 30 op

Artificial Intelligence

521156S: Towards Data Mining, 5 op
521289S: Machine Learning, 5 op
521283S: Big Data Processing and Applications, 5 op
811168P: Information Security, 5 op

Computer Science

521453A: Operating Systems, 5 op
031023P: Mathematical Structures for Computer Science, 5 op
521286A: Computer Systems, 8 op
521043S: Internet of Things, 5 op
521348S: Statistical Signal Processing 1, 5 op

Mining Technology and Mineral Processing

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440264: Complementary Module, Mining Technology and Mineral Processing, 20 - 30 op

Electives

493300A: Principles of mineral processing, 5 op
493302A: Chemical phenomena in mineral processes, 5 op
772335A: Introduction to ore mineralogy, 5 op
493605S: Ore benefication technologies, 5 op

Mechanical Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440255: Supplementary Module, Mechanical Engineering, 20 - 30 op

Common courses

462107A: Maintenance of machines, 5 op
462109S: Simulation and modelling of machines, 8 op
521043S: Internet of Things, 5 op

Machine Design

462103A: Introduction to Maintenance, 5 op

462101A: Information technology and machines, 5 op
462102A: Machine automation actuators, 5 op
464105S: Computer aided design, 5 op
462105A: Machine Sensor Technology, 5 op
462111S: Machine diagnostics, 10 op
Mechatronics
521077P: Introduction to Electronics, 5 op
521302A: Circuit Theory 1, 5 op
461106A: Dynamics, 5 op
462110S: Advanced course in mechatronics, 8 op
521160P: Introduction to Artificial Intelligence, 5 op
Production engineering
462104A: Machine automation, 5 op
463104A: Advanced manufacturing methods, 7 op
463109S: Computer aided manufacturing, 7 op

Process Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440249: Supplementary Module, Process Engineering, 20 - 30 op
Process engineering
477304A: Separation Processes, 5 op
477203A: Process Design, 5 op
477309S: Process and Environmental Catalysis, 5 op
477204S: Chemical Engineering Thermodynamics, 5 op
Process Engineering B
477123S: Chemical processing of biomasses, 5 op
477124S: Mechanical processing of biomasses, 5 op
477126S: Manufacturing of fibre products, 5 op
477128S: Circular Bioeconomy, 5 op
Autumation engineering
477621A: Control System Analysis, 5 op
477622A: Control System Design, 5 op
477524S: Process Optimization, 5 op
477624S: Control System Methods, 5 op

Civil and Construction Engineering (previous Civil Engineering)

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440263: Complementary Module, Civil Engineering, 20 - 30 op
Structural Engineering
485109A: Numerical methods in structural engineering, 5 op
466107S: Design of concrete structures, 6 op
485108A: Desing of Steel Structures and Steel Construction, 5 op
485107A: Timber construction and product technology, 5 op
Traffic and road construction engineering
485401A: Basics of Traffic Engineering, 5 op
485402S: Advanced Course in Traffic Engineering, 5 op
485403A: Basics of Road Engineering, 5 op
485404S: Road Design and Construction, 5 op

Environmental Engineering

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op
A440256: Supplementary Module, Environmental Engineering, 20 - 30 op
Enviromental Engineering A
488209S: Renewable Energy, 5 op
488501S: Smart Grid I: Integrating renewable energy sources, 5 op
488502S: Smart Grid II: Smart buildings/smart customers in the smart grid, 5 op
488503S: Smart Grid III: Smart energy networks, 5 op
Enviromental engineering B
477309S: Process and Environmental Catalysis, 5 op
488203S: Industrial Ecology, 5 op

488214S: Air Pollution Control Engineering - Practical Solutions, 5 op
488215S: Industry and Environment, 5 op
Environmental engineering C
488110S: Water and Wastewater Treatment, 5 op
488134S: Hydrogeology and groundwater engineering, 5 op
488135S: Water distribution and sewage networks, 5 op
488206S: Sustainable Energy Project, 5 op

Other engineering module

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

ELECTIVE STUDIES, 0 - 10 ECTS cr (enintään 10 op)

If the minimum of the degree's courses of 90 ECTS cr is not completed, you can complete the degree with elective studies. The courses 555212P Orientation Course for New Students, 030008P Information Skills for Foreign Degree Students and 900017Y Survival Finnish Course are compulsory for new International Master's Program students. Also studies in language -, business or entrepreunership are recomended. For IMP's students Finnish language studies are recommended. More information can be found in WebOodi's course catalogues (example Oulu Business School and Extension School).

555306M: Elective Studies in other Universities /Institutes, 0 - 30 op
A440269: Special Module, 0 - 10 op
International students should select 555212P, 030008P and 900017Y
555212P: Orientation Course for New Students, 1 op
030005P: Information Skills, 1 op
030008P: Information Skills for foreign degree students, 1 op
900017Y: Survival Finnish, 2 op
Recommended studies
555214A: Working in the university community, 5 op
555215A: Working life project, 5 op
555310S: Demola Project, 5 op

MASTER'S THESIS and related Studies, 30 ECTS cr (30 op)

555300S: Master's Thesis, 30 op
555302S: Maturity Test / Master of Science in Industrial Engineering and Management, 0 op

Bachelor of Science in Technology, Industrial Engineering and Management

Tutkintorakenteen tila: published

Lukuvuosi: 2019-20

Lukuvuoden alkamispäivämäärä: 01.08.2019

BASIC AND INTERMEDIATE STUDIES (vähintään 120 op)

- Choose the language in which you have a long high school course curriculum.
- Choose 2nd domestic language

555207M: Basic Studies in other Universities/ Institutes, 0 - 30 op
A440120: Basic and Intermediate Studies, Industrial Engineering and Management, 119,5 - 120 op
STUDY AND COMMUNICATION SKILLS
555203P: Study Skills, 2 op
900061A: Scientific Communication for Production Engineering and Management, 2 op
900062P: Communicative Oral Skills for Production Engineering and Management, 2 op

030005P: Information Skills, 1 op

FOREIGN LANGUAGE(choose one)

902150Y: Professional English for Technology, 2 op

902143Y: Company Presentations, 2 op

FOREIGN LANGUAGE(English 2 ECTS cr,elective)

902142Y: Business Correspondence, 2 op

902145Y: Working Life Skills, 2 op

CHOOSE ONE

901044Y: Second Official Language (Swedish), Written Skills, 1 op

901045Y: Second Official Language (Swedish), Oral Skills, 1 op

MATHEMATICS

031010P: Calculus I, 5 op

031078P: Matrix Algebra, 5 op

031075P: Calculus II, 5 op

031076P: Differential Equations, 5 op

031021P: Probability and Mathematical Statistics, 5 op

PHYSICS

761118P: Mechanics 1, 5 op

761119P: Electromagnetism 1, 5 op

761310A: Wave motion and optics, 5 op

COMPUTER SCIENCE

521141P: Elementary Programming, 5 op

ECONOMICS

724110P: Introductory Economics, 5 op

724105P: Management Accounting, 5 op

555213A: Sales and marketing, 5 op

IEM STUDIES

555225P: Basics of industrial engineering and management, 5 op

555285A: Project management, 5 op

555265P: Occupational Safety and Health Management, 5 op

555226A: Operations and supply chain management, 5 op

555264P: Managing well-being and quality of working life, 5 op

555286A: Process and quality management, 5 op

555242A: Product development, 5 op

555287A: Problem Solving in Business Cases, 5 op

555204A: Internship, 5 op

555208M: Intermediate Studies in other Universities/Institutes, 0 - 30 op

ENGINEERING STUDIES (vähintään 40 op)

Electrical Engineering

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

A440149: Module Preparing for the Major, Electrical Engineering, 40 op

Common studies

521109A: Electrical Measurement Principles, 5 op

521302A: Circuit Theory 1, 5 op

521301A: Digital Techniques 1, 8 op

Electronics

521077P: Introduction to Electronics, 5 op

521104P: Introduction to Material Physics, 5 op

521071A: Principles of Semiconductor Devices, 5 op

521431A: Principles of Electronics Design, 5 op

521303A: Circuit Theory 2, 5 op

Wireless Communication

031077P: Complex analysis, 5 op

031080A: Signal Analysis, 5 op

521330A: Telecommunication Engineering, 5 op

521329A: Hands-on Course in Wireless Communication, 5 op

521337A: Digital Filters, 5 op

Biomedical Engineering (Previous Medical and Wellness Technology)

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440146: Module Preparing for the Major, Medical and Wellness Technology, 40 op
Biomedical Engineering
080901A: Introduction to Technology in Clinical Medicine, 5 op
764163P: Introduction to Biomedical Physics, 5 op
521109A: Electrical Measurement Principles, 5 op
080925A: Anatomy and Physiology for Biomedical Engineering, 5 op
031077P: Complex analysis, 5 op
031080A: Signal Analysis, 5 op
041201A: Basics in eHealth, 5 op
521124S: Sensors and Measuring Techniques, 5 op

Software Engineering

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440147: Module Preparing for the Major, Software Engineering, 40 op
Common studies: 521145A or 811177P
521145A: Human-Computer Interaction, 5 op
811177P: Humans as Users and Developers of Information Technology, 5 op
Common studies
811379A: Basics of Human Computer Interaction, 5 op
811167P: Introduction to Information Systems Design, 5 op
811168P: Information Security, 5 op
811391A: Requirements Engineering, 5 op
Common: 521457A tai 811346A
521457A: Software Engineering, 5 op
811346A: Software Engineering, 5 op
Software production
811174P: Introduction to Software Business, 5 op
811104P: Programming 1, 5 op
Information Systems
815345A: Software Architectures, 5 op
811395A: Basics of Databases, 5 op

Information Engineering

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440148: Module Preparing for the Major, Information Engineering, 40 op
Common Studies
521160P: Introduction to Artificial Intelligence, 5 op
521287A: Introduction to Computer Systems, 5 op
Artificial Intelligence
805305A: Introduction to Regression and Analysis of Variance, 5 op
521495A: Artificial Intelligence, 5 op
811395A: Basics of Databases, 5 op
521157A: Introduction to Social Network Analysis, 5 op
811312A: Data Structures and Algorithms, 5 op
031025A: Introduction to Optimization, 5 op
Computer Science
521145A: Human-Computer Interaction, 5 op
810122P: Computer Architecture, 5 op
521301A: Digital Techniques 1, 8 op
521150A: Introduction to Internet, 5 op
521159P: Principles of Digital Fabrication, 5 op
521337A: Digital Filters, 5 op

Mining Technology and Mineral Processing

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440145: Module Preparing for the Major, Mining Technology and Mineral Processing, 40 op
Electives
491101P: Introduction to mining, 5 op
477121A: Particle Technology, 5 op

477122A: Bulk Solids Handling, 5 op
477401A: Thermodynamic Equilibria, 5 op
477221A: Material and Energy Balances, 5 op
771113P: Introduction to Geology I, 5 op
771117P: Basic course in mineralogy, 5 op
774311A: A Basic Course in Geochemistry, 5 op

Mechanical Engineering

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440141: Module Preparing for the Major, Mechanical Engineering, 40 op
Common Studies
464101A: Machine drawing and CAD, 5 op
465101A: Introduction to materials for mechanical engineering, 5 op
463101A: Introduction to manufacturing technology, 5 op
xxxxxx
462103A: Introduction to Maintenance, 5 op
462101A: Information technology and machines, 5 op
462102A: Machine automation actuators, 5 op
Machine Design
461102A: Statics, 5 op
461103A: Strength of materials I, 5 op
464102A: Design of machine elements, 10 op
464103A: Machine design, 5 op
Mechatronics
462104A: Machine automation, 5 op
462105A: Machine Sensor Technology, 5 op
462106A: Precision engineering, 5 op
521301A: Digital Techniques 1, 8 op
462108S: Mechatronics, 6 op
Production engineering
463102A: Manufacturing technology I, 5 op
521159P: Principles of Digital Fabrication, 5 op

Process Engineering

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440143: Module Preparing for the Major, Process Engineering, 40 op
Common studies
477013P: Introduction to Process and Environmental Engineering, 5 op
477052A: Fluid Mechanics, 5 op
477401A: Thermodynamic Equilibria, 5 op
477221A: Material and Energy Balances, 5 op
477323A: Mass and Heat Transfer, 5 op
Process engineering
477121A: Particle Technology, 5 op
477122A: Bulk Solids Handling, 5 op
477222A: Reactor Analysis, 5 op
Automation engineering
477051A: Automation Engineering, 5 op
477502A: Experiment design and analysis, 5 op
477501A: Process dynamics, 5 op

Civil Engineering

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440142: Module Preparing for the Major, Civil Engineering, 40 op
Electives
485201A: Building information modeling and CAD, 5 op
461102A: Statics, 5 op
461103A: Strength of materials I, 5 op
466101A: Introduction to building construction, 5 op
466102A: Introduction to structural design, 3 - 5 op

485021A: Construction Contracting, 5 op
488115A: Geomechanics, 5 op
485103A: Building physics, 5 op

Environmental Engineering

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A440144: Module Preparing for the Major, Environmental Engineering, 40 op
Electives
477013P: Introduction to Process and Environmental Engineering, 5 op
477401A: Thermodynamic Equilibria, 5 op
477052A: Fluid Mechanics, 5 op
477221A: Material and Energy Balances, 5 op
477323A: Mass and Heat Transfer, 5 op
488102A: Hydrological Processes, 5 op
488210A: Environmental science and technology, 5 op
488505A: Waste managemet and recycling, 5 op

Other Engineering Studies

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op
A400072: Module Preparing for the Option, 20 - 40 op

OPTIONAL STUDIES (enintään 10 op)

Optional Studies.

Choose the courses to get total of 180 ECTS to your degree.

555206M: Elective studies in other Universities/Institutes, 0 - 30 op
A440171: Optional Studies, Bachelor of Science (Industrial Engineering and Management), 0 - 20 op
IEM electives
555214A: Working in the university community, 5 op
555215A: Working life project, 5 op

BACHELOR'S THESIS AND RELATED STUDIES (vähintään 10 op)

555200A: Bachelor's Thesis / Industrial Engineering and Management, 8 op
555201A: Bachelor's Thesis Seminar, 2 op
555202A: Maturity Test / Bachelor of Science in Industrial Engineering and Management, 0 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

466111S: Building physics, 5 op
488129S: Foundation Engineering, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

555307M: Common Studies of the Majors in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440231: Major Studies, Production Management, 40 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Module of the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

555313S: Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Language of instruction:

English

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of general management
- know the historical developments in the management thought
- have an understanding about the qualifications of a manager in a modern organisation
- understand the principles of the managerial decision making
- distinguish between the terms management and leadership
- have an understanding about good managerial practices

Contents:

Managers and Managing, The Evolution of Management Thought, Values, Attitudes, Emotions, and Culture: The Manager as a Person, Ethics and Social Responsibility, Managing Diverse Employees in a Multicultural Environment, Decision Making, The Manager as a Planner and Strategist, Managing

Organisational Structure and Culture, Organisational Control and Change, Motivation and Performance, Leadership, Effective Groups and Teams, Promoting Effective Communication, Managing Conflict, Politics, and Negotiation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 10 h, case examples 10 h, self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Jones G. R. & George J.M (2014) Contemporary Management. McGraw-Hill. Case descriptions.

Assessment methods and criteria:

The assessment is based on the exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ D. Sc. Hannele Lampela

Working life cooperation:

No.

Other information:

-

555314S: Management Information Systems, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannele Lampela

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3 - 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the key concepts of management information systems
- understand the significance of information and information management in modern business and business process management
- define the information needs of management processes and understands how information systems can meet these needs
- recognise the current trends in management information systems technologies and practices and find out the relevant MIS information sources

- participate in enterprise information system designing, purchasing, and development tasks as a role of industrial engineer/process developer
- strengthen the self-directing, reflective learning skills

Contents:

Key concepts: management information systems (MIS), managerial information, different types of MIS applications, information systems in decision making and leadership, the effects of information technology in business processes and their development. Current trends in management information systems technologies and practices, business driven IT infrastructure and management, special characteristics of business development projects that contain ICT implementation.

Mode of delivery:

The tuition will be implemented as face-to-face teaching. If active participation for the course is not possible, independent learning method is offered including a case study in a student's own work organisation (independent learning method is available only for IEM students).

Learning activities and teaching methods:

Lectures 14 h, self-study and group work 117 h. The implementation methods of the self-study and group work vary.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent, 555313S Management.

Recommended optional programme components:

Basic understanding of some business process areas helps learning (e.g. production management, supply chain management, sales and marketing management).

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment based on conducting the learning tasks (individual and group work). Since the implementation of self-study and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

D. Sc. Hannele Lampela

Working life cooperation:

The course includes the guest lectures of industry to offer various and topical views to MIS in practice.

Other information:

Substitutes the course 555344S Management Information Systems.

555301S: Research Seminar, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannele Lampela

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Teaching during periods 1 - 4. Course can be completed in parts. Course registration is open during 15.8. - 15.5.

Learning outcomes:

Upon completion of the course, the student will be able to:

- know scientific process and different research methods
- select an appropriate method for his/her master's thesis work
- evaluate validity of research work and provide constructive criticism
- report research findings in the form of academic research report and participate in academic discussion

Contents:

Research approach, qualitative and quantitative research methods, structure of research report, evaluating validity of research, constructive criticism and participation in scientific discussion.

Mode of delivery:

Multiform learning, with face-to face lectures, seminar work and independent learning. The course will use Moodle platform.

Learning activities and teaching methods:

Lectures and seminar work 20 h, independent learning 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

Research report is based on research work student is doing for his/her master's thesis work

Recommended or required reading:

Lecture material. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course can be completed in seminar sessions by actively participating in discussion, presenting own research work, giving feedback on other student's research work, acting as an opponent to two ready thesis works, and writing a scientific article on own research topic. The seminar sessions will include three lectures on research approach and qualitative and quantitative research methods, and writing a scientific article. Participation in these three lectures is required to pass the course and they are lectured two times a year.

Grading:

The course utilizes verbal grading "Pass/Fail".

Person responsible:

D. Sc. Hannele Lampela

Working life cooperation:

No.

Other information:

The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage "Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" - menu.

555304S: Advanced Internship, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555311S	Advanced Internship	3.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

English

Timing:

Periods 1 - 4 and summer

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the working life (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- reflect the tasks to IEM studies completed
- analyse and find development targets in IEM courses related to the tasks

Contents:

Communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills

Mode of delivery:

The tuition will not be organised. The student is responsible for finding the internship position that can be a summer job, some other salaried position or work experience, or a position without salary in an organization.

Learning activities and teaching methods:

Students complete tasks with their own activities to support their own professional growth in working-life. Internship duration should be at least 2 months.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

Bachelor's degree or equivalent knowledge.

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

The internship must provide at least 2 months working experience related to your studies. Internship period cannot be the same as in course 555204A Harjoittelu. The length of the written report is 2-3 pages and it must address the following questions:

- Where (organization name, location) did you perform the internship?
- How did you find this position (PESTI-days or some other way)?
- How was the application procedure? Was there an interview etc?
- Have you worked in this organization earlier?
- What tasks were you doing during the internship period?
- Were these tasks related to your major, supplementary, or engineering studies?
- Which theories or skills in IEM courses were useful in your job?
- What type of topics should be added to the IEM courses based on your internship experience?

The report and a certificate provided by the organization where internship took place must be sent via email to your teacher tutor (Product Management, Tuotantotalouden tutkinto- ja maisteriohjelmat).

Grading:

Pass/ Fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Yes. The student gains working experience in an organization.

Other information:

Information about internship placements and financial support can be found in Oulu University's webpage about traineeship. On traineeship issues you can contact the traineeship contact person for Faculty of Technology

Substitutes the course 555311S Advanced Internship.

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

-

555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

A440259: Complementary Study Module of the Major/ Organization and Knowledge management, Advanced Module, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Obligatory studies of Organisation and knowledge management

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: English

Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: English

Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

Elective advanced studies

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education’s Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T.

(Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases. Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op
555326S	Research Project in Production Management	5.0 op
555348S	Research Project in Technology Management	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company's development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Kirsi Aaltonen
Opintokohteen kielet: English
Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:

different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555285A Basic course in project management.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Kujala

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools
- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

-

Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results
- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

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Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company
- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

-

555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

A440260: Complementary Study Module of the Major/ Project Management, Advanced Module, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Obligatory studies of Project Management

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:

different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555285A Basic course in project management.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Kujala

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

Elective advanced studies

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education's Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T. (Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases. Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op
555326S	Research Project in Production Management	5.0 op
555348S	Research Project in Technology Management	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company’s development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Organisation and knowledge management

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: English

Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: English
Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools
- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

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Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results
- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

-

Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company

- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

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555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

A440261: Complementary Study Module of the Major/ Process and Quality Management, Advanced Module, 15 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Obligatory studies of Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools

- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

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Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results
- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

-

Elective advanced studies

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education’s Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T. (Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases. Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op
555326S	Research Project in Production Management	5.0 op
555348S	Research Project in Technology Management	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company's development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

Project Management

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:

different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555285A Basic course in project management.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Kujala

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

Organisation and knowledge management

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: English

Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: English
Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

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555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company
- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM

- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company’s HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company’s business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

A440270: Complementary Module, Other Industrial Engineering and Management Studies, 20 - 30 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Supplementary Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Elective studies (max 10 cr)

555226A: Operations and supply chain management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555222A	Demonstration in Industrial Engineering and Management	2.0 op
555223A	Introduction to Production Control	3.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- describe different production types
- apply different forecasting methods, plan needed production capacity, and apply location and transportation decisions related methods
- master common inventory management methods and aggregated and short-term scheduling
- create a sales and operations plan for a company

Contents:

Production types, forecasting methods, capacity planning and queuing models, location and transportation decisions, inventory management systems, aggregate scheduling, MRP & ERP, short-term scheduling, linear programming.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 16 hours / independent studying 64 hours.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management or similar knowledge.

Recommended optional programme components:

Industrial Engineering and Management students will complete 902143Y Company presentations course simultaneously.

Recommended or required reading:

Lecture and exercise materials. Krajewski, L.J. et al. (2012) Operations management: processes and supply chains, 10th ed. Pearson. In addition, recommended material includes chapter 13 in Heizer, J. & Render, B. (2014) Operations management: sustainability and supply chain management, 11th ed. Pearson.

Assessment methods and criteria:

This course utilises continuous assessment. During the course, there are mandatory weekly assignments. At least half of the assignments must be passed. 40 % of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Post-doctoral researcher Farzad Pargar.

Working life cooperation:

The group work will be done for a real company by using public information sources.

Other information:

Substitutes course 555222A Demonstration in Industrial Engineering and Management 2 ECTS cr and 555223A Introduction to Production Control 3 ECTS cr.
Previous course name was 'Operations and Production'.

555242A: Product development, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

ay555242A	Product development (OPEN UNI)	5.0 op
555240A	Basic Course in Product Development	3.0 op

Ei opintojaksokuvauksia.

555264P: Managing well-being and quality of working life, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555264P	Managing well-being and quality of working life (OPEN UNI)	5.0 op
555261A	Basic Course in Occupational Psychology	3.0 op
555262A	Usability and Safety in Product Development	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- set targets and choose appropriate methods of developing well-being at work both at personal and organizational levels
- develop well-being at work in the contexts of labor legislation, good practices, productivity, occupational safety expertise, management and human resources
- know the key sources of information, typical goal-setting and management practices and the methods for assessing the performance at individual and organizational levels
- assess the economic impacts of well-being at work, especially in cases of work ability, occupational health, job satisfaction, occupational safety, productivity and the overall quality of working life
- know essential national and international regulation and strategic goal setting practices, good practices of the case companies, current trends, and methods in research.

Contents:

The course gives the student a vision of building sustainable, productive and satisfactory career. The contents cover the whole area of basic quality issues of working life analysing them in the following framework "Well-being at work means safe, healthy, and productive work in a well-led organisation by competent workers and work communities who see their job as meaningful and rewarding, and see work as a factor that supports their life management".

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 10 h / self-study 70 h / group work & exercises 42 h.

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial Engineering and Management that also includes 555225P Basics of industrial engineering and management**,** 555285P Project Management, 555242A Product development, and 555286A Process and quality management.

Recommended or required reading:

Applicable parts of Arnold, J. et al. (2010), Work Psychology; Understanding Human Behaviour in the Workplace. 5th Edition. Financial Times/Prentice Hall and Aura, O. & Ahonen, G. Strate-gisen hyvinvoinnin johtaminen, Alma Talent. Other literature will be informed during the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), group work (weight 40 %) and examination (weight 40 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

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Other information:

Substitutes courses 555261A Basic Course in Occupational Psychology + 555262A Usability and Safety in Product Development.

555285A: Project management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

555288A	Project Management	5.0 op
ay555285A	Project management (OPEN UNI)	5.0 op
555282A	Project Management	4.0 op
555280P	Basic Course of Project Management	2.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material may also be used.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- describe explain the essential concepts and methods related to project management
- apply project management methods to create a schedule for a project and calculate critical path
- understand essential concepts related to project cost management and able to apply earned value method and three point estimate to manage project costs
- recognises the essential tasks of project risk management

Contents:

Defining project management, project goals and objectives, project phases and project life-cycle management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management, project stakeholder management, project communications management, the role of project manager, new modes of project delivery

Mode of delivery:

The tuition will be implemented as web-based teaching.

Learning activities and teaching methods:

Web-based lectures 16h, self-study 118h

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes555225P Basics of industrial engineering and management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended or required reading:

Lecture material, exercise book, Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY

Assessment methods and criteria:

Assignments, exercise book and exam. The course grading is based on the exam. Well completed assignments and exercise book may raise grading.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry

Other information:

Substitutes courses 555280P Basic Course of Project Management + 555282A Project Management.

555286A: Process and quality management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555286A	Process and quality management (OPEN UNI)	5.0 op
555281A	Basic Course of Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the role of process and quality management in a business organisation
- develop business processes based on the principles of quality management and appropriate tool

Contents:

Foundations of total quality management, planning of quality, performance measurement, process management, people management in relation to quality management, implantation of total quality management.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

20 h lectures, 114 h independent study

Target group:

Industrial Engineering and Management students and other students studying Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

-

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes 555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, and 555264P Managing well-being and quality of working life.

Recommended or required reading:

Oakland, J.S. (2014) Total quality management and operational excellence (4th ed.). Routledge, 529 pp. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must pass the weekly course exercises (50 % of the course grade) and an exam (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555281A Basic Course of Quality Management.

Elective advanced studies

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

555360S Administration, Organization and Education in Working Life 5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education's Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T. (Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases. Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op
555326S	Research Project in Production Management	5.0 op
555348S	Research Project in Technology Management	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company's development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Project Management

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:

different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555285A Basic course in project management.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

Organization and knowledge management

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: English

Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: English
Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools
- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

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Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results
- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

-

Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company

- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

-

555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440253: Supplementary Module, Electronics and Communications Engineering, 20 - 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electronics

521432A: Electronics Design I, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Ilkka Nissinen, Kari Määttä
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Spring, period 4.

Learning outcomes:

1. should be able to recount the principles covering the design of multistage amplifiers

2. should be able to analyze and set the frequency response of a transistor amplifier

3. should be able to make use of feedback to improve the properties of an amplifier in the desired manner

4. should be able to analyze the stability of a given degree of feedback amplification and to dimension an amplifier correctly to ensure stability

5. should be able to describe the principles governing the design of power amplifiers

6. should be able to make widespread use of operational amplifiers for realizing electronic circuits and to take account of the limitations imposed by the non-idealities inherent in operational amplifiers

7. should be able to design low-frequency oscillators, to explain the operating principles of radio frequency oscillators and tuned amplifiers

Contents:

Frequency response of a transistor amplifier, differential amplifier, feedback, power amplifiers, oscillators and tuned amplifiers, non-idealities of an operational amplifier, applications of operational amplifiers.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h and exercises 20 h.

Target group:

Students of Electrical engineering. Other students of the University of Oulu may also participate.

Prerequisites and co-requisites:

Principles of electronic design

Recommended optional programme components:

This course is required when participating in Laboratory Exercises on Analogue Electronics.

Recommended or required reading:

Lecture notes, book: Behzad Razavi, “Microelectronics”, 2nd Edition, ISBN 9781-118-16506-5
John Wiley & Sons 2015

Assessment methods and criteria:

Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Juha Kostamovaara

Working life cooperation:

-

Other information:

-

521070A: Introduction to Microfabrication Techniques, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teirikangas, Merja Elina

Opintokohteen kielet: Finnish

Leikkaavuudet:

521218A	Introduction to Microelectronics and Micromechanics	4.0 op
521218A-02	Introduction to Microelectronics and Micromechanics, demonstration	0.0 op
521218A-03	Introduction to Microelectronics and Micromechanics, exercise	0.0 op
521218A-01	Introduction to microelectronics and micromechanics, exam	0.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

2nd period

Learning outcomes:

1. Can present the process of source materials used to manufacture micro- and nanoelectronics /mechanics and analyse the required material properties depending of the application

2. Can explain the fabrication methods and discuss the characteristic features of each fabrication method, inculding their utilisation and restrictions.

3. Is capable of designing a fabrication process for a simple microelectronics application and is able to indetify the process steps also in complex application.

Contents:

The content of the course covers fabrication methods of micro-, nano- and optoelectronics as well as MEMS systems. 1. Fabrication methods for silicon based electronics and MEMS systems 2. Additive manufacturing methods 3. Nanomaterials and fabrication.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

Lectures (20 hours) and exercises (10 +10).

Target group:

Electrical engineering bachelor degree students.

Prerequisites and co-requisites:

Course content of 521104P Introduction to Materials Physics and 521071A Principles of Semiconductor Devices.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes, Franssila Sami: Introduction to Microfabrication

Assessment methods and criteria:

Final written exam and passes laboratory exercises.

Grading:

Numerical grading 1-5.

Person responsible:

Merja Teirikangas

Working life cooperation:

No

521404A: Digital Techniques 2, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Lahti
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

In Finnish. Exams can be arranged in English on demand.

Timing:

Autumn, period 2

Learning outcomes:

1. knows the common architectures of synchronous digital logic circuits, and the building blocks they consist of, and can design digital circuits that realize complex data and signal processing functions.
2. knows most common combinational and sequential logic based buildning blocks, and can use them to design and realize complex digital circuits.
3. knows digital logic design methods, such as use of hardware description languages, functional verification using simulation, realization of logic with a logic synthesis program, and functional and timing verification of gate-level models.

Contents:

1. Logical and physical properties of digital logic components. 2. Representation of digital designs. 3. Combination logic design. 4. Sequential logic design. 5. Digital artithmetics. 6. Semiconductor memories. 7. Register transfer level architecture design. 8. Register transfer level modeling and synthesis. 9. Timing design. 10. Digital interface design. 11. Design verification

Mode of delivery:

Classroom

Learning activities and teaching methods:

Lectures 24h/ exercises 30h (group work)/independent work 84h.

Target group:

Primarily electrical and computer science and engineering students. Also other student of University of Oulu can take the course.

Prerequisites and co-requisites:

Digital techniques 1

Recommended optional programme components:

No

Recommended or required reading:

Lecture textbook (in finnish) and literature announced during course.

Assessment methods and criteria:

Final exam and a design excercise, or weekly assignments consisting of theoretical and design exercises.
Read more about assessment criteria at the University of Oulu webpage.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5, The grade is the average of the exam and the design exercise, or the grade of the weekly assignments.

Person responsible:

Jukka Lahti

Working life cooperation:

No

Other information:

-

521307A: Laboratory Exercises on Analogue Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Määttä

Opintokohteen kielet: Finnish

Leikkaavuudet:

521316A	Introduction to Broadband Transmission Techniques	4.0 op
521433A	Laboratory Exercises on Analogue Electronics	3.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn, periods 1-2

Learning outcomes:

1. is able to design basic electronic structural blocks and verify their functionality in a CAD simulation environment.

2. is able independently to realize and test a small-scale design object employing analogue circuit techniques.

Design exercises to deepen the understanding of the material presented in Principles of Electronics Design and Analogue Electronics I.

Contents:

Passive RC-circuits, diodes and their applications, bipolar transistor amplifiers, operational amplifiers and their applications, MOS-transistor, tuned circuit and amplifier, oscillator.

Mode of delivery:

Face-to-face teaching, partially independent work

Learning activities and teaching methods:

Independent design and simulating excercise 26 h and guided laboratory work 15 h. Group size is 1 - 2 students.

Target group:

Primarily in electrical engineering students. Other University of Oulu students can complete the course.

Prerequisites and co-requisites:

Student must participate to courses Principles of Electronics Design and Electronics Design I, or he/she must have passed these courses earlier.

Recommended optional programme components:

No

Recommended or required reading:

Lecture notes of Principles of Electronic design and Electronics design 1.

Assessment methods and criteria:

Teacher accepts student's design work and measurement results in laboratory.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes verbal grading scale pass or fail

Person responsible:

Kari Määttä

Working life cooperation:

No

Other information:

-

521075S: Microelectronics Packaging Technologies, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Sami Myllymäki

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

3rd period

Learning outcomes:

1. Upon completing the course student can explain how electronics packaging technology has since invention of transistors to current date, and can estimate how this development is going to continue in future.

2. The student can describe can explain what is meant by microjoining techniques and what are the pros and cons of these.

3. The student can tell what different kind of materials, and why, are used in IC packaging technology.

4. The student can explain what is meant with system level packaging and how the strong miniaturization on IC requires new system level packaging techniques to be developed.

5. He can explain why active and passive components are being, more and more, embedded to be a part of the circuit board.

6. In addition he can explain why and how optoelectronics will be migrate towards circuit board and components on it.

Contents:

Trends of packaging and component technologies. Area array packaging techniques. BGA-components. Micro joining and bonding. Multi-chip-modules: MCM-L, MCM-D and MCM-C modules. Fine line techniques. System level packaging (SOC, SOP). Multilayer substrates and integration of passive components. 3-D packaging. Optoelectronics modules. MEMS components. Electronics applications to nanotechnology.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lecturing 24 h, practical work 12 h.

Target group:

Primarily major students of electrical engineering.

Prerequisites and co-requisites:

Recommended Introduction to Microfabrication Techniques.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Rao R. Tummala(edit): Fundamentals of microsystems packaging, New York, McGraw-Hill, 2001. R.R. Tummala and M. Swaminathan, Introduction to System-on-Package (SOP), McGraw-Hill, 2008.

Assessment methods and criteria:

The course is completed with the final exam and finished course work.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Sami Myllymäki

Working life cooperation:

No

Other information:

-

521089S: Printed Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Fabritius

Opintokohteen kielet: Finnish

Leikkaavuudet:

521217S	Printed Electronics	4.0 op
521095S	Advanced Course of Printed Electronics	3.0 op

ECTS Credits:

5

Language of instruction:

Finnish. English if more than two international students in the course.

Timing:

Period 3.

Learning outcomes:

1. Knows the most typical materials and printing methods suitable for their processing
2. Can explain the principles of materials and printing methods
3. Can utilize the material and manufacturing process knowledge to design fabrication processes for electrical components
4. Can analyse how the selected materials and printing methods influence on the performance of electrical components

Contents:

Materials (conductive and semi-conductive polymers, photoactive polymers, dielectrics, particle based inks) and processing methods (screen printing, gravure printing, flexo printing, inkjet) utilized in printed electronics, surface wetting and film formation, printed electrical components (passive components, solar cells, light emitting diodes, transistors) and their fabrication. Possibilities and challenges of printing based processing methods and how to take them into account in the printed electronics fabrication.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Combined lectures and exercises 30 h and self-study 100 h

Target group:

Primarily for the students of electrical engineering

Prerequisites and co-requisites:

None.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

D.R. Gamota, P. Brazis, K. Kalyanasundaram and J. Zhang, "Printed organic and molecular electronics", handout

Assessment methods and criteria:

Course is completed by final examination.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Tapio Fabritius

Working life cooperation:

Not included.

521098S: Testing Techniques of Electronics and Printed Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Fabritius

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish. English, if there are more than 2 foreign students.

Timing:

Period 4.

Learning outcomes:

1. After completing the course the student is able to analyze different kinds of testing strategies, and is able to enhance the testability of electronics through the use of design for testability.
2. The student can also compare different testing techniques of analogue and digital electronics, which have been implemented using either embedded testing methods or external automatic testing equipment.
3. Additionally, the student is able to analyze tests made using an automatic test instrument, compare different test interfaces and data busses, and recognizes principles of design of a high-quality printed test circuit board.

4. The Student understands the specific features of printed electronics having an influence on electronics testing and reliability.

Contents:

Overview of different testing methods, constructions of testers, test fixtures, test signal generation and measurement, mixed-signal test buses, DC- and parametric measurements, dynamic tests, AD/DA converter tests, DSP-based tests, data analysis, embedded testing, design for testability, Boundary scan, test applications.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 26h/Exercises 14h and self-studying 100 h.

Target group:

Course is compulsory for the Electrical engineering students in the advanced module of Testing techniques and printed electronics.

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course unit: Electronics Design I, Electronic Measurement Techniques.

Recommended optional programme components:

This course compensates 521098S Testing Techniques of Electronics if the student hasn’t got credits from it.

Recommended or required reading:

M. Burns, G. W. Roberts: An Introduction to Mixed-Signal IC Test and Measurement, Lecture slides. Additional material will be announced at the beginning of the course.

Assessment methods and criteria:

Exam and passed lab exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grade is based on exam and grade is on numerical scale 1-5.

Person responsible:

Tapio Fabritius

Working life cooperation:

No.

Wireless communication engineering

521303A: Circuit Theory 2, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

Leikkaavuudet:

521306A	Circuit Theory 2	4.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn, period 2

Learning outcomes:

After the course the student can:
1. use Laplace transform for solving time and frequency response of electric circuits;
2. derive continuous-time transfer functions.;
3. solve their poles and zeros and understand the meaning of those;
4. draw the pole-zero map and Bode plots of any given transfer function;
5. construct 2-port parameter models of a given circuit

Contents:

Use of Laplace transform in network analysis. Properties of network functions, poles and zeros, Boden magnitude and phase plots. 2-port parameter models.

Mode of delivery:

Classroom

Learning activities and teaching methods:

30h lectures, 22 h exercises, and simulation excerices.

Target group:

Finnish BSc students

Prerequisites and co-requisites:

Basics of circuit theory, differential equations.

Recommended optional programme components:

Continuation for Circuit theory 1. Needed in most analog electronics courses.

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 12-18.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical 1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

521384A: Basics in Radio Engineering, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Risto Vuohtoniemi, Aarno Pärssinen

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn, 1st period

Learning outcomes:

1. can define what radio engineering is and list its separate areas and applications from FM-radio to 5G systems.

2. understands the meaning of Maxwell's equations and can solve the propagation of radio waves in a homogeneous medium.

3. can solve EM-fields at an interface of two lossless media.

4. knows main properties of most common transmission line types and can solve EM-fields for coaxial lines and rectangular waveguides.

5. can utilize the methods based on the Smith chart for the impedance matching of microwave circuits and antennas.

6. understands the meaning of Y-, Z-, and S-matrix and can use S-parameters for solving characteristics of microwave circuits.

7. can describe the operation of passive transmission line devices, resonators, filters and circuits based on the semiconductor devices.

8. knows the terms to describe antenna characteristics and can define radiation patterns of simple antennas and antenna arrays.

9. knows different propagation phenomena and can evaluate, which phenomena are relevant in different radio systems in different frequency bands.

10. can describe the structure of a typical radio system and can calculate the S/N-ratio link budget for a radio system on a free-space radio link.

Contents:

Introduction to radio waves and radio engineering. Maxwell’s equations. Fundamentals of electromagnetic fields. Transmission lines and waveguides. Impedance matching. Microwave circuit theory. Passive transmission line and waveguide devices. Resonators and filters. Circuits based on semiconductor devices. Antennas. Propagation of radio waves. Radio system. Applications of radio engineering.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 26 h and exercises 16 h including graded exercise problems.

Target group:

3 rd year bachelor’s degree students.

Prerequisites and co-requisites:

Elementary knowledge of the electromagnetic theory.

Recommended optional programme components:

-

Recommended or required reading:

In Finnish: Antti Räisänen & Arto Lehto: Radiotekniikan perusteet. Otatieto, 2011; also older versions of the book can be used as a course book.
Additional reading in Finnish: Jyrki Louhi & Arto Lehto: Radiotekniikan harjoituksia. Otatieto, 1995.
In English: Antti V. Räisänen & Arto Lehto: Radio Engineering for Wireless Communication and Sensor Applications, Artech House, 2003.
Additional literature in english: D.M. Pozar: Microwave Engineering, 4th edition, John Wiley & Sons, Inc., 2012.

Assessment methods and criteria:

The course is passed with a final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Risto Vuohtoniemi, Aarno Pärssinen.

Working life cooperation:

No

Other information:

-

521304A: Filters, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

Leikkaavuudet:

521331A	Filters	4.0 op

ECTS Credits:

5

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Spring, period 3

Learning outcomes:

After the course the student can:
1. draw a pole-zero map for a given transfer function;
2. perform impedance and frequency scaling for component values;
3. choose an appropriate prototype filter and filter degree;
4. synthesize passive RLC filters;
5. synthesize active opamp based filters;
6. can compare various filter technologies;
7. understands the basics of scaling the dynamic range of active filters

Contents:

Filter types and prototypes, component scaling. Synthesis of active and passive filters. Sensitivity analysis and scaling of the dynamic range.

Mode of delivery:

Lectures, excercise and design excercise

Learning activities and teaching methods:

30 h lectures, 16 h exercises. A design excercise.

Target group:

Finnish electrical engineering students

Prerequisites and co-requisites:

Basics of circuit theory, Bode plots and analog design.

Recommended optional programme components:

Course Digital filters expands the topic into digital domain.

Recommended or required reading:

van Valkenburg: Analog Filter Design, 1982, chapters1-14, 18 ja 20 ; or year 2001 edition chapters 1-13.

Assessment methods and criteria:

Circuit is examined by a final exam. Also the obligatory design exercise must be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

521395S: Wireless Communications I, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Kokkonen, Jari Iinatti

Opintokohteen kielet: English

Leikkaavuudet:

521395S-01	Wireless Communications I, Exam	0.0 op
521395S-02	Wireless Communications I, Exercise	0.0 op
521323S	Wireless Communications I	5.0 op
521323S-02	Wireless Communications I, Exercise	0.0 op
521320S	Wireless Communications 2	8.0 op
521320S-01	Intermediate exam or final exam, Wireless Communications 1	0.0 op
521320S-02	Exercisework, Wireless Communications 2	0.0 op
521323S-01	Wireless Communications I, Exam	0.0 op

ECTS Credits:

5

Language of instruction:

English

Timing:

Fall, period 1

Learning outcomes:

Student
1. can analyze the performance of multilevel digital modulation methods in AWGN channel
2. can explain the effect of fading channel on the performance of the modulation method and can analyze the performance
3. recognizes and understand suitable diversity methods for fading channel and related combining methods
4. can understand and explain coding methods for wireless channels
5. recognizes different wideband systems
6. understands the cellular system principle

Contents:

Radio channel models, digital modulation and detection methods, carrier and symbol synchronization, performance of digital modulation in AWGN and fading channel, diversity techniques, coding for wireless channel, multicarrier modulation, spread spectrum, cellular systems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercise (total 40 hours) and the compulsory design work with a simulation program (20 h)

Target group:

1st year WCE students and M.Sc. students (i.e., 4th year in ECE degree programme)

Prerequisites and co-requisites:

521330A Telecommunication Engineering

Recommended optional programme components:

-

Recommended or required reading:

Andrea Goldsmith: Wireless Communications, Cambridge University Press, 2005.

Assessment methods and criteria:

The course is passed with minor exams (only during lecture period) or with final exam; and the accepted design work report. In the final grade of the course, the weight for the examination(s) is 0.6 and that for the design work report 0.4.

Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jari Iinatti / Timo Kokkonen

Working life cooperation:

No

Other information:

-

521340S: Communications Networks I, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Ylianttila

Opintokohteen kielet: English

ECTS Credits:

5 ECTS cr

Language of instruction:

English

Timing:

Fall, period 2

Learning outcomes:

1. Students understand how the modern communications networks have evolved and how the architecture has changed through the recent paradigm shift towards software-centric communications.
2. Students are able to describe the basic system architecture elements of mobile networks, and understands the significance of emerging technologies such as Network Function Virtualization (NFV), Software Defined Networking (SDN), and core network functionalities such as Evolved Packet Core (EPC).
3. Students can describe the main principles of mobility management, network management and orchestration, and network security, and can apply and solve related engineering problems.
4. Students know the basic properties of routing algorithms, and can use graph theory to solve network routing problems.

5. Students are able to simulate different types of networks in simulation environments and solve basic network programming problems. Upon completing the required coursework, students understand the basic functionalities in TCP/IP protocol stack.

Contents:

Communications architecture in mobile, wireless local area and personal area networks. Introduction to cloud and edge computing, network function virtualization and software defined networking. Basic principles of mobility management, network security, network management and orchestration. The goal is to present the basics of the modern communications architectures, and their technical implementation.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 30 h and the compulsory design work (15 h). Design work can be done alternatively either as NS-2 simulation or TCP/IP programming exercise. Design work instructions are provided in digital learning environment (Optima / Moodle).

Target group:

1st year M.Sc. and WCE students

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Software Defined Mobile Networks (SDMN): Beyond LTE Network Architecture, M Liyanage, A Gurtov, M Ylianttila – 2015; A comprehensive Guide to 5G Security, M Liyanage, I Ahmad, A Abro, A Gurtov, M Ylianttila – 2018; In addition, selected supportive online reading materials from recent standards and publications are provided in digital learning environment (Optima / Moodle).

Assessment methods and criteria:

The course is passed with a final examination and the accepted design work report. The final grade is based on examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Mika Ylianttila

Working life cooperation:

No

Other information:

-

521349S: Wireless Communications II, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti-Heikki Tölli

Opintokohteen kielet: English

ECTS Credits:

5

Language of instruction:

English

Timing:

Spring, periods 3-4

Learning outcomes:

1. The student is familiarised with the channel capacity as the fundamental performance measure of wireless communication links, and can explain the effect of fading channel on the capacity in a single-user single-antenna scenarios.
2. The student understands the basic principles for multiuser communications in fading channels, apprehends the notion of capacity region for multi-access and broadcast channels, and is familiarised with different practical multiple access, random access and scheduling methods.
3. The student is acquainted with core principles of adaptive transmission, which requires accurate channel estimates at the receiver and a reliable information exchange mechanisms between the receiver and transmitter. Practical variable-rate variable-power MQAM modulation techniques for fading channels are introduced.
4. The student understands the principles of transmitter and receiver design in the presence of channel distortion. The student is familiarised with various (adaptive) equalization solutions to combat intersymbol interference.
5. Finally, the student is acquainted with the capacity optimal multi-antenna transmission and reception scheme, as well as, with basic multiantenna space-time coding schemes in a single-user multiple-input multiple-output (MIMO) communications scenario.

Contents:

Capacity of wireless channels, multiuser communications, adaptive modulation and coding, equalization, point-to-point MIMO communications and space-time coding.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercise (total 40 hours) and the compulsory design work with a simulation program (20 h).

Target group:

1st year WCE students and M.Sc. students (i.e., 4th year in ECE degree programme).

Prerequisites and co-requisites:

In addition to courses “521395S Wireless Communications I”, 521348S “Statistical Signal Processing I”, 031025A “Introduction to optimization” and 031051S “Numerical matrix analysis”, a working knowledge in digital communications, random processes, linear algebra, matrix manipulation and detection theory is required.

Recommended optional programme components:

Prior knowledge of 521390S Information Theory and 521392S Convex Optimisation is very useful but not mandatory. The course 521324S Statistical Signal Processing II is recommended to be taken in parallel.

Recommended or required reading:

D. N. C. Tse and P. Viswanath, Fundamentals of Wireless Communication. Cambridge University Press, 2005, Chapters 3-7.
Andrea Goldsmith: Wireless Communications, Cambridge University Press, 2005, Chapters 4, 9-11. 14.
Supporting material: Cover & Thomas, "Elements of Information Theory", John Wiley & Sons; Boyd & Vandenberghe, "Convex Optimization", Cambridge University Press, 2004.

Assessment methods and criteria:

The course is passed with a final examination and the accepted simulation work report. The final grade is a weighted sum of exam (70%), homework (20%), and work report (10%).

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Antti Tölli

Working life cooperation:

No

Other information:

Course replaces the old course 521317S Wireless Communications II (8cr).

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440265: Complementary Module, Medical and Wellness Technology, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

764327A: Virtual measurement environments, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: Finnish
Leikkaavuudet:

764627S	Virtual measurement environments	5.0 op

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

Finnish (or English)

Timing:

Bachelor studies, autumn term, 2nd period

Learning outcomes:

The student will learn how to construct software environments for measurements and data analysis important in biomedical engineering and physics.

Contents:

The course gives basic skills to use measuring and analyzing programmes applied not only in academic research but also in R&D of the companies, and their programming environments (Matlab, LabView).

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 12 h, project work 65 h, self-study 58 h

Target group:

Bachelor students of Medical and Wellness Technology and Physics. Also for other students of the University of Oulu.

Prerequisites and co-requisites:

Basics / basic skills in programming

Recommended optional programme components:

The course is independent entity and does not require additional studies carried out at the same time. The course can also be completed as a part of advanced studies with the course code 764627S.

Recommended or required reading:

Lecture and exercise notes, other given material

Assessment methods and criteria:

Completion of projects.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5 or fail. In the numerical grading scale zero stands for a fail. Grading is made based on the projects.

Person responsible:

Professor Timo Jämsä

Working life cooperation:

None

521273S: Biosignal Processing I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 50 hours of work

Language of instruction:

English. Examination can be taken in English or Finnish.

Timing:

The course unit is held in the autumn semester, during period 2. It is recommended to complete the course at the end of studies.

Learning outcomes:

After completing the course, student
1. knows special characteristics of the biosignals and typical signal processing methods
2. can solve small-scale problems related to biosignal analysis
3. implement small-scale software for signal processing algorithms

Contents:

Biomedical signals. Digital filtering. Analysis in time-domain and frequency domain. Nonstationarity. Event detection. Signal characterization.

Mode of delivery:

Face-to-face teaching and guided laboratory work. The laboratory work can alternatively be performed on an online system.

Learning activities and teaching methods:

Lectures 10h, Laboratory work 20h, Self-study 20h, written examination.

Target group:

Students interested in biomedical engineering, at their master's level studies.
Students of the University of Oulu.

Prerequisites and co-requisites:

The mathematic studies of the candidate degree program of computer science and engineering, or equivalent. Programming skills, especially basics of the Matlab. Basic knowledge of digital signal processing.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

The course is based on selected chapters of the book "Biomedical Signal Analysis", R.M Rangayyan, 2nd edition (2015). + Lecture slides + Task assignment specific material.

Assessment methods and criteria:

Laboratory work is supervised by assistants who also check that the task assignments are completed properly. All task assignments are compulsory. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Tapio Seppänen

Working life cooperation:

No.

080929S: Health Technology and Multimodal Monitoring, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credit points /135 hours of work.

Language of instruction:

English

Timing:

The course is held in the Spring semester, during period III.

Learning outcomes:

The course provides students with a broad overview of the health technology that is currently in development and becoming for home and/or clinical use.
Students learn the concepts of multimodal monitoring and examples of its usage in clinical applications and in medical research (including human and animal studies).

Contents:

Multimodal monitoring is increasingly being employed in clinical monitoring and in the study of human physiology. It is the simultaneous measurement of multiple physiological parameters to provide better context for their interpretation and correlations, and to enable studies of relationships between different physiological signals. Besides the concepts of multimodal monitoring, this course provides students a broad overview of the health technology that is currently in development and becoming for home or clinical use. Moreover, their usage in medical applications and for different study purposes (human and animal) are dealt.

Mode of delivery:

Web-based teaching + Face-to-face teaching

Learning activities and teaching methods:

Lectures, demonstrations, seminars and self-study

Target group:

Medical and Biomedical students

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Reading material will be provided during the course.

Assessment methods and criteria:

The assessment of the course is based on the learning outcomes of the course, based on the seminar work and exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Teemu Myllylä

Working life cooperation:

There is no working life cooperation in this course.

521097S: Wireless Measurements, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Saarela

Opintokohteen kielet: English

Leikkaavuudet:

521114S	Wireless Measurements	4.0 op
521114S-01	Wireless Measurements, exam	0.0 op
521114S-02	Wireless Measurements, exercise work	0.0 op

ECTS Credits:

5 ECTS credits / 128h

Language of instruction:

In Finnish or in English if two or more foreign students participate.

Timing:

Period 3.

Learning outcomes:

1. can tell and justifying argument the benefits and challenges of using wireless measurement solutions
2. can apply the most important standards when designing wireless measurement solutions
3. can apply wireless technologies in industrial, traffic, environmental, home and healthcare measurements

Contents:

Basics of wireless measurement technologies and standards, wireless sensors and sensor networks, wireless building and smart home applications, wireless measurement applications in traffic, wireless environmental measurements and wireless human health monitoring.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 22h. Seminars 6-12h depending on the number of students participating the course. The students prepare seminar presentations about contemporary topics selected by themselves or proposed by the teacher and give 10 minutes presentation to other students in the seminars.

Target group:

Master level students regardless of master's programme.

Prerequisites and co-requisites:

No prerequirements, but basics of measurements systems are recomended.

Recommended optional programme components:

The course replaces previous courses with same name, but different credits and code.

Recommended or required reading:

Lecture notes and seminar reports is Optima.

Assessment methods and criteria:

The course is passed with a written final exam (70 %) and a contemporary seminar (30 %).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grade is on numerical scale 1-5.

Person responsible:

Juha Saarela

Working life cooperation:

No.

080916S: Biomechanics of Human Movement, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: English

Status:

-

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

English

Timing:

Master´s studies, spring term 4th period

Learning outcomes:

The student can describe the main challenges of movement biomechanics and principles for motion analysis.
The student understands basics of biomechanical measurement and modeling of movement.
The student can perform practical biomechanical experiments, analyze measurement data, interpret results, and report them using good scientific reporting practice.

Contents:

Musculoskeletal biomechanics. Motion sensors and motion analysis. Biomechanical modeling of movement. Balance measurement. Fall biomechanics. Measurement of physical activity.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 14h / assignment and group work 54 h /self-study 67h. Final exam.

Target group:

Master´s students of Biomedical Engineering, medical and wellness technology, information technology and other related degree programs. Master´s students of physics (biomedical physics). Other interested master's and postgraduate students.

Prerequisites and co-requisites:

The student needs to have basic knowledge on statistical analysis, sensors and measurement techniques and signal processing. It is also recommended to have basic knowledge on anatomy and physiology.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. Tissue biomechanics will be studied in the course 080915S.

Recommended or required reading:

Material given during lectures.

Assessment methods and criteria:

Accepted home exercises and lab assignments, exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. Grading is made based on the exercise report and exam.

Person responsible:

Professor Timo Jämsä

Working life cooperation:

None

521093S: Biomedical Instrumentation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: Finnish

Leikkaavuudet:

521107S	Biomedical Instrumentation	6.0 op

ECTS Credits:

5

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

After the course the student is capable to explain principles, applications and design of medical instruments most commonly used in hospitals. He/she can describe the electrical safety aspects of medical instruments and can present the physiological effects of electric current on humans. In addition the student is able to explain medical instrumentation development process and the factors affecting it. He/she also recognizes typical measurands and measuring spans and is able to plan and design a biosignal amplifier.

Contents:

Diagnostic instruments (common theories for medical devices, measurement quantities, sensors, amplifiers and registering instruments). Bioelectrical measurements (EKG, EEG, EMG, EOG, ERG), blood pressure and flow meters, respiration studies, measurements in a clinical laboratory, introduction to medical imaging methods and instruments, ear measurements, heart pacing and defibrillators, physical therapy devices, intensive care and operating room devices and electrical safety aspects.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures/exercises 42 h and self-study 100 h.

Target group:

Students interested in biomedical measurements.

Prerequisites and co-requisites:

None

Recommended optional programme components:

Course replaces earlier courses Biomedical measurements and Biomedical instrumentation.

Recommended or required reading:

R. S. Khandpur: Biomedical Instrumentation, Technology and Applications, McGraw-Hill, 2005 and J. G. Webster: Medical Instrumentation, Application and Design, 4th edition, John Wiley & Sons, 2010.

Assessment methods and criteria:

The course is passed by the final exam or optionally with the assignments/test agreed at the first lecture. Read more about assessment criteria at the University of Oulu webpage.

Grading:

1 - 5.

Person responsible:

Teemu Myllylä

Working life cooperation:

No.

080927S: Connected Health and mHealth, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jarmo Reponen

Opintokohteen kielet: English

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn semester period I (1st period)

Learning outcomes:

Upon completion of the course:
-The students will have knowledge about the current overall status of clinical use of health information systems and related tools (e.g. e-Health, telemedicine, Virtual Hospital, ODA-portal and other self-care portals) in Finland
-The students will have knowledge about the state of the art development in mobile health technology solutions and connected health projects.
-The students have been introduced to some practical development examples taking place in OYS Testlab and possibly in other Oulu health test labs
-The students have had an opportunity to consult with some enterprises currently working in the m-Health / Connected health domain.
-Depending on the student composition of the course, the students have learned collaboration in a multiprofessional environment in the medical information and communication technology domain.

Contents:

Terms and concepts
-overview of information and communication technology and information systems in Finnish healthcare
-new processes that activate patient: virtual hospital, self-care models
-current update about mHealth, Connected Health, Artificial Intelligence in health care, secondary use of healthcare information
-collaborative development process in multiprofessional healthcare environment
-introduction to test laboratories
-case example, depending of current R&D&I work at the time of course
-web discussions and possible group assignments

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

The implementation methods of the course vary. The course will consist of a combination of self-learning materials and activating workshops and other modules. The below mentioned amounts are approximations, because the actual contents will vary according to available development projects:
-virtual learning material in the university virtual learning environment (recorded lectures, examples, additional material) /With self-learning 40 hours of students time
-activating facilitated workshops, where the iterative innovation process is introduced to the students + introductions to the test laboratory environment + Special Key-note lectures either in the virtual environment or as participatory lectures in seminars/With self-learning 40 hours of students time
-Discussions and participation to web tasks /With self-learning 40 h of students time
-Exams and related work/15 h hours of student time

Target group:

Students of the Master´s Programs in Biomedical Engineering and Medical & Wellness Technology. The course will also be available as an elective course for medicine, health sciences, information technology and other interested degree programs.

Prerequisites and co-requisites:

None

Recommended optional programme components:

It is recommended that the student has completed the course 041201A Basics in eHealth.

Recommended or required reading:

Recommended or required reading is offered in Oulu University virtual learning environment or in linked web pages. The teachers can recommend additional material in the beginning of the course.

Assessment methods and criteria:

Web tasks, contribution to moderated discussion and workshops, and course exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1 – 5 or fail.

Person responsible:

Professor Jarmo Reponen (responsible teacher)
Professor Minna Pikkarainen
Course assistant Anna Maijala MSc

Working life cooperation:

The facilitated workshops are meant to be organized in collaboration with OuluHealth TestLabs and enterprises according to availability.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440266: Complementary Module, Software Engineering, 20 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Supplementary Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common studies

811372A: Software Development, Maintenance and Operations, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Mäntylä

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 1st autumn semester of the Master's studies.

Learning outcomes:

After completing the course, the student is able to:
- explain and utilize theories of software evolution
- utilize the processes, techniques and tools for software deployment, and operations
- utilize the processes, techniques and tools for software maintenance
- utilize the processes, techniques and tools to better understand and maintain large code bases

Contents:

Software Evolution. Principles and practices of software maitenance. Software operations and Devops. Software Product line engineering: Commonality and Variation.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 24 h, homework 60 h, independent study 31 h

Target group:

MSc students

Prerequisites and co-requisites:

Basics on software engineering. Basic programming skills.

Recommended or required reading:

Software Evolution and Maintenance, Priyadarshi Tripathy, Kshirasagar Naik, ISBN: 978-0-470-60341-3, 416 pages, January 2015. TODO Maëlick add the DevOps book we are currently using
DevOps: A Software Architect's Perspective (SEI Series in Software Engineering), Len Bass, Ingo Weber, Lining Zhu (ISBN: 978-0134049847), May 2015
Pohl, K., Böckle, G., van der Linden, F. Software Product Line Engineering. Foundations, Principles, and Techniques, Springer-Verlag, 2005; chapters 1-5, 10, 15, 19-20. Chastek G.J., Donohoe P., McGregor J.D., Formulation of a Production Strategy for a Software Product Line, Technical Note CMU/SEI-2009-TN-025, Carnegie Mellon, 2009. Software Evolution and Maintenance, Priyadarshi Tripathy, Kshirasagar Naik, ISBN: 978-0-470-60341-3, 416 pages, January 2015

Assessment methods and criteria:

Assignments and exercises

Grading:

Numerical scale 1-5 or fail

Person responsible:

Mika Mäntylä

Software Production

811373A: Professional Software Engineering Processes and Human Factors, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Ei opintojaksokuvauksia.

812331A: Interaction Design, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Information Processing Science DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Netta Iivari
Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 1st autumn semester of the Master's studies.

Learning outcomes:

After completing the course, the student can assess the role of human interaction with IT products, systems, and services and identify factors and problems related to it within a practical design case. The student is able to: use methods for analysis and evaluation of existing interfaces; understand the role of requirements, plan and conduct a simple requirements collection and analysis; use basic principles of usability and user experience for user interface design; use interaction design methods in designing for target user experiences.

Contents:

The course provides an overview of interaction design, introducing the terminology and fundamental concepts, the main activities, and the importance of user involvement in the design process. The course addresses establishing requirements for IT products, systems, and services. The focus is on usability and user experience from the viewpoint of the intended users, their tasks and the context of use. The course covers user-centered methods for designing for and evaluating usability and user experience of IT products, systems, and services. All the main activities of interaction design are carried out in a practical design case.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 20 h, exercises and seminar 25 h, individual and group assignments 90 h; or self-study: an opening lecture 2 h, one larger
assignment 110 h and individual tasks 21 h.

Target group:

MSc students

Prerequisites and co-requisites:

Basic knowledge on human-computer interaction with usability and user-centered design.

Recommended or required reading:

Sharp et al. (2015) Interaction Design, chapters 1-2, 4-5, 7-13 (pages 1-64, 100-157, 226-473).

Assessment methods and criteria:

Accepted assignments.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Netta Iivari

Working life cooperation:

Invited lectures, assignments.

521041A: Applied Computing Project I, 8 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Aku Visuri, Matti Pouke

Opintokohteen kielet: Finnish, English

Leikkaavuudet:

521151A	Applied Computing Project I	10.0 op

ECTS Credits:

8 ECTS credits / 216 hours of work

Language of instruction:

Finnish and English

Timing:

3rd semester (periods 1-4)

Learning outcomes:

Upon completion of the course, the student will be able to:
1. has basic understanding on how to collaboratively design a small-scale software project,
2. has basic understanding on how to implement and evaluate a small-scale software project,
3. is able to extensively document a small-scale software project,
4. is able to present and "pitch" a project work, i.e. give a good, concise presentation of the work

Contents:

The basics concepts and practices of implementing a software project in the domain of applied computing

Mode of delivery:

Fact-to-face teaching, project work in groups

Learning activities and teaching methods:

8 hours of introductory lectures. Majority of the course is guided project work

Target group:

3rd year Computer Science and Engineering B.Sc. students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Elementary Programing (521141P), Human-Computer Interaction (521145A) or corresponding skills

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Dix, Finlay, Abowd & Beale: Human-Computer Interaction (http://www.hcibook.com); Rogers, Sharp & Preece: Interaction Design: Beyond Human-Computer Interaction (http://www.id-book.com).

Assessment methods and criteria:

The course uses continuous assessment so that the project work is assessed in stages: design (20% of total grade), implementation (40%), evaluation (20%), and final report (20%). Passing criteria: all stages (design, implementation, evaluation, report) must be completed with an approved grade. Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5; zero stands for a fail.

Person responsible:

Matti Pouke and Aku Visuri

Working life cooperation:

The projects that the students will undertake are defined either by the research group or industry partners. In the projects defined by the industry, the students will carry out a development project to create a solution for the company's genuine and existing challenges. The project reports regularly to the project steering group consisting of a supervising teaching assistant as well as the company representative. In addition, the course canl have guest lectures from industry regarding collaborative software development and evaluation practices.

Other information:

The 521275A course offers the possibility to complete your Bachelor thesis in a structured course environment. The course is suitable also for students who do not use the course for their Bachelor Thesis.

817602S: Software Development in Global Environment, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppänen, Veikko Johannes

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

English

Timing:

Academic year 2019-2020

Learning outcomes:

After completing the course, the student can define the key success factors of Global Software Design (GSD) and the potential problems in coordination of projects where teams are separated by physical and / or temporal distance; can define and evaluate the collaborative technologies, which in the best way support distributed software development; can choose the methods and tools for distributed software development; can apply the practices of GSD in a student project and use the supporting tools throughout the project life cycle.

Contents:

Some of the topics covered are strategic issues in distributed development (off-shoring, near-shoring, outsourcing, OSS); cost-benefit-risk analysis; the triad of coordination, control and communication; team building (e.g. virtual teams); software process paradigms in the global environment (planned, agile); methods and tools for distributed software development; issues related to allocation of tasks; communication issues that arise due to distance and time zone differences; infrastructure support; geographical dispersion; lack of information communication; coordination complexity; cultural issues; technical issues related to information and artefact sharing; architectural design; and finally knowledge management issues. The lectures and seminars also review current research aspects of the GSD and related case studies from industry. The exercises demonstrate distributed software development as a virtual team with the support of appropriate methods and tools.

Mode of delivery:

Independent work

Learning activities and teaching methods:

An independent assignment agreed with the person responsible for the course,
professor Veikko Seppänen (Veikko. Seppanen@oulu.fi).

Target group:

MSc students

Prerequisites and co-requisites:

Basic knowledge of academic writing technique is needed. Basic understanding of software business is an advantage.

Recommended or required reading:

To be announced during the course implementation.

Assessment methods and criteria:

By active participation or alternatively exam, based on the course study materials.

Grading:

Numerical scale 1-5 or fail

Person responsible:

Veikko Seppänen

Other information:

Course does not have any lectures or exercises in academic year 2019-2020. It is still possible to do course, please sent email to Professor Veikko Seppänen veikko.seppanen@oulu.fi

815662S: Software Engineering Management, Measurement and Improvement, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Oivo, Markku Tapani

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course in the 2nd autumn semester.

Learning outcomes:

After completing the course the student understands the fundamental principles of software processes and their development in professional software engineering. The course extends the understanding of quality based on individual techniques (e.g. reviews) so that after completing the course the student is able to:
- Understand professional software development processes in agile, lean and traditional environments
- Evaluate different methods and techniques
- Select from them appropriate ones for different software engineering environments
- Have capabilities to participate in systematic efforts for improvement in software companies.

Contents:

The course covers the most fundamental process centred software quality improvement and management approaches, methods and latest research results, as well as approaches to software measurement. The topics of the course include: traditional waterfall, agile (extreme programming, Scrum, Rational unified process, crystal, feature driven development, adaptive software development, dynamic systems development method) and lean methods, process improvement approaches, software process and product measurement, agile and lean practices, process improvement at the enterprise level and practical examples from software industry.

Mode of delivery:

Face-to-face teaching + Seminars.

Learning activities and teaching methods:

9 Lectures (30 hours), 7 Seminars (30 hours), Individual weekly assignments (43 hours), Group work (30 hours).

Target group:

MSc students

Prerequisites and co-requisites:

BSc or other equivalent degree and basic knowledge of software engineering.

Recommended or required reading:

- Agile Project Management with Scrum. Ken Schwaber, Microsoft Press, ISBN 0-7356-1993-X. 2004
- Dingsøyr T., Dybå T., Moe N.B., Agile Software Development: Current Research and Future Directions, Springer, 2010
- C. Jones, Applied Software Measurement: Global Analysis of Productivity and Quality, 3rd ed. McGraw-Hill Osborne Media, 2008
- Craig Larman and Bas Vodde, Scaling Lean & Agile Development: Thinking and Organizational Tools for Large-Scale Scrum, Addison-Wesley, 2009
- CMMI: Guidelines for Process Integration and Product Improvement. Mary Beth Chrissis, Mike Konrad, Sandy Shrum. Addison-Wesley, ISBN 032-115496-7, 2004.

Assessment methods and criteria:

Active and regular participation to lectures and seminars AND report evaluation AND seminar presentations.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Markku Oivo

Working life cooperation:

Visiting lecture from industry.

521156S: Towards Data Mining, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Tamminen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish or English

Timing:

Autumn, period I.

Learning outcomes:

Student can recognize the type of the data before further analysis and the required preprocessing. The concrete learning outcomes are:
1. Student can design and implement the data gathering
2. Student can combine data from different sources
3. Student can normalize and transfor data, and handle missing or incorrect data.
4. Student can ensure the generalizability of the results.

Contents:

Course provides good ability to start Master's Thesis or graduate studies. Topics at the course include data mining process in general level, data gathering and different data types, quality and reliability of the data, data preparation including the processing of missing values, outliers, and privacy issues, combination of signals from several sources, utilization of data bases in data mining process, and normalization and transformation of data and interdependence of the observations and their distributions. Additionally, topics concerning the generality of the results are covered, as well as, the principles of data division, for example, train-test-validate, cross-validation and leave-one-out methods.

Mode of delivery:

Lectures, independent work, group work

Learning activities and teaching methods:

16 h lectures, 16 h exercises, independent studying.

Target group:

The course is suitable for Master level students in Computer science and engineering study programmes, for minor subject studies or for doctoral students.

Prerequisites and co-requisites:

031021P Probability and Mathematical Statistics or similar

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out and exercise material will be provided. The course book will be announced in the beginning of the course. The material is mostly in English.

Assessment methods and criteria:

Weekly pre-lecture assignment + exercise submissions, and final exam. Half of the grade will be based on the submissions and half on the final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5; zero stands for a fail.

Person responsible:

Tamminen Satu

Working life cooperation:

-

Other information:

-

Information systems

813623S: Information Security Policy and Management in Organisations, 5 op

Voimassaolo: 01.08.1950 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

English

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 2nd spring semester of the Master's studies.

Learning outcomes:

After completing the course, the student is able to:
* develop BCM (Business Continuity Management) and SA (Systems Availability) strategy;

* develop organization specific information security policies in organizations;
* conduct Information Security (and risk) Analysis;
* conduct Information Security Audits;
* understand information security standards, regulations, and policies;
* improve employees' compliance with the information security procedures through training, campaigning and other means;
* describe certifications related to information security (such as ISO27001); as well as
* describe public-key infrastructure (PKI), Digital signature, & Certification authority (CA).

Contents:

* Business Continuity Management (BCM) and Systems Availability (SA)
* Information Security Life Cycle
* Conduct Information Security (and risk) Analysis;
* Information security standards, regulations, and policies
* Information security investment management
* Insider threats in information security management
* Security Audits (Active Security Assessment)
* Information Security Certification (ISO27001) & Certification authority (CA)

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (24 h), exercises (23 h), homework (30 h), essay (20 h), examination (36 h).

Target group:

MSc students

Prerequisites and co-requisites:

Understanding of information security issues, principles, techiniques, or similar knowledge, is helpful.

Recommended optional programme components:

Recommended or required reading:

Raggad, Bel G.: Information security management, Concepts and practice, CRC Press 2010, Chapters 1, 2.7. – 2.13, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, and 15.

Assessment methods and criteria:

Examination.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Nataliya Shevchuk

521453A: Operating Systems, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521453A	Operating Systems (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish, material available in English

Timing:

Spring, period 4

Learning outcomes:

1. is capable of explaining the basic structure and functioning of operating system

2. is able to point the problems related to process management and synchronization as well as is able to apply learned methods to solve basic problems

3. is capable of explaining the cause and effect related to deadlocks and is able to analyse them related to common circumstances in operating systems

4. is able to explain the basics of memory management, the use of virtual memory in modern operating systems as well as the structure of the most common file-systems.

Contents:

Operating system structure and services, process management, process synchronization, deadlocks, memory management, virtual memory, file-systems

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures 36 h, laboratory exercise 4 h, the rest as independent work. The laboratory work, including pre-exercise and guided exercise performed in a group of one or two students in the unix environment, covers core topics of the course.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521286A Computer Systems or 521142A Embedded Systems Programming and 521267A Computer Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes (in Finnish) and exercise material. Silberschatz A., Galvin P., and Gagne G.: Operating System Concepts, 6th edition (or newer), John Wiley & Sons, Inc., 2003. Chapters 1-12.

Assessment methods and criteria:

The course is passed the final examination and accepted laboratory working.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Juha Röning and Jaakko Suutala (lectures)
Anna-Mari Wartiainen (exercises)

Working life cooperation:

-

Other information:

-

811312A: Data Structures and Algorithms, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ari Vesanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521144A	Algorithms and Data Structures	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish. One English exercise group will be arranged.

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course in the 2nd autumn semester of the Bachelor's studies.

Learning outcomes:

After completing the course the student is able to
- Select a data structure and an algorithm to an application
- Analyze correctness and time complexity of an algorithm implemented in a program
- Apply induction when proving algorithm correctness and define recursive algorithms
- Describe the most common sorting algorithms
- Describe trees, graphs and their basic algorithms, and apply them in a program

Contents:

* Basic data structures
* Analysis of algorithms
* Sorting algorithms
* Hash tables
* Binary search trees
* Graphs and their algorithms
* Algorithm design paradigms

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 48 h, exercises 21 h, exercise work 27 h, independent study 39 h.

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Databases

Recommended optional programme components:

Recommended or required reading:

Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, Second edition, MIT Press 2001 (or newer) and other material defined during the course.

Assessment methods and criteria:

1. Exam and assignment OR 2. Mid-term exams (2) and assignment

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Ari Vesanen

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440267: Complementary Module, Information Engineering, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Artificial Intelligence

521156S: Towards Data Mining, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Computer Science and Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Satu Tamminen
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish or English

Timing:

Autumn, period I.

Learning outcomes:

Student can recognize the type of the data before further analysis and the required preprocessing. The concrete learning outcomes are:
1. Student can design and implement the data gathering
2. Student can combine data from different sources
3. Student can normalize and transfor data, and handle missing or incorrect data.
4. Student can ensure the generalizability of the results.

Contents:

Course provides good ability to start Master’s Thesis or graduate studies. Topics at the course include data mining process in general level, data gathering and different data types, quality and reliability of the data, data preparation including the processing of missing values, outliers, and privacy issues, combination of signals from several sources, utilization of data bases in data mining process, and normalization and transformation of data and interdependence of the observations and their distributions. Additionally, topics concerning the generality of the results are covered, as well as, the principles of data division, for example, train-test-validate, cross-validation and leave-one-out methods.

Mode of delivery:

Lectures, independent work, group work

Learning activities and teaching methods:

16 h lectures, 16 h exercises, independent studying.

Target group:

The course is suitable for Master level students in Computer science and engineering study programmes, for minor subject studies or for doctoral students.

Prerequisites and co-requisites:

031021P Probability and Mathematical Statistics or similar

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out and exercise material will be provided. The course book will be announced in the beginning of the course. The material is mostly in English.

Assessment methods and criteria:

Weekly pre-lecture assignment + exercise submissions, and final exam. Half of the grade will be based on the submissions and half on the final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5; zero stands for a fail.

Person responsible:

Tamminen Satu

Working life cooperation:

-

Other information:

-

521289S: Machine Learning, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521497S-01	Pattern Recognition and Neural Networks, Exam	0.0 op
521497S-02	Pattern Recognition and Neural Networks; Exercise Work	0.0 op
521497S	Pattern Recognition and Neural Networks	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

English. Examination can be taken in English or Finnish.

Timing:

The course unit is held in the spring semester, during period III. It is recommended to complete the course at the end of studies.

Learning outcomes:

After completing the course, student
1. can design simple optimal classifiers from the basic theory and assess their performance.

2. can explain the Bayesian decision theory and apply it to derive minimum error classifiers and minimum cost classifiers.

3. can apply the basics of gradient search method to design a linear discriminant function.

4. can apply regression techniques to practical machine learning problems.

Contents:

Introduction. Bayesian decision theory. Discriminant functions. Parametric and non-parametric classification. Feature extraction. Classifier design. Example classifiers. Statistical regression methods.

Mode of delivery:

Face-to-face teaching, guided laboratory work and independent assignment.

Learning activities and teaching methods:

Lectures 16 h, Laboratory work 16 h, Exercise 16 h and Self-study the rest (Independent task assignment, written examination).

Target group:

Students who are interested in data analysis technology. Students of the University of Oulu.

Prerequisites and co-requisites:

The mathematic studies of the candidate degree program of computer science and engineering, or equivalent. Programming skills, especially basics of the Matlab.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Duda RO, Hart PE, Stork DG, Pattern classification, John Wiley & Sons Inc., 2nd edition, 2001. Handouts.

Assessment methods and criteria:

Laboratory work is supervised by assistants who also check that the task assignments are completed properly. The independent task assignment is graded. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. The final grade is established by weighing the written exam by 2/3 and the task assignment by 1/3.

Person responsible:

Tapio Seppänen

Working life cooperation:

No

521283S: Big Data Processing and Applications, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ekaterina Gilman

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits

Language of instruction:

English

Timing:

Period IV. It is recommended that the course is taken on the fourth year Spring.

Learning outcomes:

Upon completion of the course, the student :

1. is able to explain the big data phenomenon, its challenges and opportunities.
2. is able to explain the requirements and common principles for data intensive systems design and implementation, and evaluate the benefits, risks and restrictions of available solutions.
3. can explain the principles of big data management and processing technologies and utilize them on a basic level.

Contents:

General introduction into big data, namely: big data fundatmenals, data storage, batch and stream data processing, data analysis, privacy and security, big data use cases.

Mode of delivery:

Face-to-face teaching, independent and group work

Learning activities and teaching methods:

Lectures, exercises, seminars, independent and group work

Target group:

M.Sc. students (computer science and engineering) and other Students of the University of Oulu

Prerequisites and co-requisites:

The Bachelor level studies of Computer science and engineering study programmes or respective knowledge.

Recommended optional programme components:

Finishing 521290S Distributed Systems, 521497S Pattern recognition and neural networks, and 521286A Computer Systems is beneficial.

Recommended or required reading:

Lecture slides and exercise material will be provided. Each lecture will include the refernce list for recommended reading. Instructions to necessary installations will be given.

Assessment methods and criteria:

This course assesses students continuously by the completion of small project work, seminar presentations and short reports on a selected topic (group work). Answering two quizzes during the course is optional and provides additional points for final grade. To pass the course, it is enough to get 50 % of available points. No exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Ekaterina Gilman

Working life cooperation:

The course includes also invited lectures from industry.

811168P: Information Security, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tero Päivärinta

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811168P Information Security (OPEN UNI) 5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course in the 1st spring semester of the Bachelor's studies.

Learning outcomes:

After completing the course a student is able to
- define essential information security concepts and components of information systems security
- recognize the common types of security threats, and their managerial and technical protection mechanisms
- describe the tasks and responsibilities of information security professionals
- explain the different phases of secure systems development/acquisition
- recognize the fundamental characteristics of risk management and is evaluate information security risks
- recognize basics of technical information security methods and cryptography
- explain areas of behavioral information security research and their practical implications

Contents:

* Basic concepts of information security
* Information security threats, vulnerabilities, and risks
* Legal issues and information security frameworks
* Risk management
* Cryptography
* Information security technologies
* Behavioral information security research

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures and related quizzes or final exam 26 h, weekly assignments and scientific essay 107 h

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Introduction to Information Processing Science as well as Devices and Data Network

Recommended optional programme components:

Recommended or required reading:

Lecture materials, selected articles, and book: Whitman & Mattord (2015). Principles of information security.

Assessment methods and criteria:

Lecture tasks or exam, weekly assignments and essay.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Tero Päivärinta

Computer Science

521453A: Operating Systems, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521453A	Operating Systems (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish, material available in English

Timing:

Spring, period 4

Learning outcomes:

1. is capable of explaining the basic structure and functioning of operating system

2. is able to point the problems related to process management and synchronization as well as is able to apply learned methods to solve basic problems

3. is capable of explaining the cause and effect related to deadlocks and is able to analyse them related to common circumstances in operating systems

4. is able to explain the basics of memory management, the use of virtual memory in modern operating systems as well as the structure of the most common file-systems.

Contents:

Operating system structure and services, process management, process synchronization, deadlocks, memory management, virtual memory, file-systems

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures 36 h, laboratory exercise 4 h, the rest as independent work. The laboratory work, including pre-exercise and guided exercise performed in a group of one or two students in the unix environment, covers core topics of the course.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521286A Computer Systems or 521142A Embedded Systems Programming and 521267A Computer Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes (in Finnish) and exercise material. Silberschatz A., Galvin P., and Gagne G.: Operating System Concepts, 6th edition (or newer), John Wiley & Sons, Inc., 2003. Chapters 1-12.

Assessment methods and criteria:

The course is passed the final examination and accepted laboratory working.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Juha Röning and Jaakko Suutala (lectures)

Anna-Mari Wartiainen (exercises)

Working life cooperation:

-

Other information:

-

031023P: Mathematical Structures for Computer Science, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Matti Peltola

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031023P	Mathematical Structures for Computer Science (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn, during period 1. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

The student is able to apply result of logic to find the truth value of logical statement and can express sentences of natural language by symbols of logic.. He/She can use arithmetic operations on different number bases. The student recognize the main types of graphs and understand the basis concepts of graphs and is able to apply formal methods of discrete mathematics to model simple information processing problems.

Contents:

1. Elementary logic 2. Mathematical induction 3. Elementary number theory 4. Set theory 5. Elementary graph theory 6. Elementary theory of formal languages 7. Theory of automata and Turing machines

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 14 h / Self-study 93 h.

Target group:

2. year students of computer science.

Prerequisites and co-requisites:

No prerequisites

Recommended optional programme components:

-

Recommended or required reading:

Recommented literature: Rosen K.H.: Discrete Mathematics and Its Applications. Gersting J.L.: Mathematical Structures for Computer Science.

Assessment methods and criteria:

The course can be completed by intermediate exams (2 exams) or by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail

Person responsible:

Matti Peltola

Working life cooperation:

-

521286A: Computer Systems, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Leppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521142A	Embedded Systems Programming	5.0 op

ECTS Credits:

8 ECTS cr

Language of instruction:

Lecturing in Finnish, course and exercise material available in English.

Timing:

Autumn, periods 1-2.

Learning outcomes:

After completing the course
Student understands the basic computer architecture and organization.
Student understands CPU operation and basic datapath operation.
Student knows different number systems and data representations in computers.
Student is familiar of I/O operation with peripheral devices in general.
Student is able to implement small programs with the C programming language for general-purpose computers for embedded systems.
Student is able to implement small assembly language programs.
Student recognizes how embedded systems programming is different from programming general-purpose computers.

Contents:

Overview of computer architecture and organization, CPU and datapath, memory hierarchies, data types, interrupts, registers and I/O, basics of the C programming language and basics of assembly language. Embedded systems programming.

Mode of delivery:

Web-based and face-to-face teaching.

Learning activities and teaching methods:

Lectures (32h), course exercises (10-30h), laboratory exercise (3h) and two course projects, one is completed in a group and the other alone.

Target group:

2nd year students of computer science and engineering and 3rd year students of electrical engineering.

Prerequisites and co-requisites:

Elementary programming 521141P.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes and exercise material are available in the course website. Literature:
Bryant & O'Hallaron, Computer Systems: A Programmer's Perspective, 3rd Edition, Chapters 1-9.
Patterson & Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5th Edition, Chapters 1-2, 4-5.

Assessment methods and criteria:

The assessment criteria is based on the learning outcomes of the course. Students complete the course exercises, participate to the laboratory exercise and complete the course projects. Assessment is based on the exercises and the course projects. More detailed information on assessment is published in the lecture material.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Teemu Leppänen

Working life cooperation:

Visiting lectures with experts from local industry are possible.

521043S: Internet of Things, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ella Peltonen

Opintokohteen kielet: English

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

English

Timing:

Spring semester during period IV

Learning outcomes:

Upon completion of the course, the student will be able to:
1. explain application areas of IoT and requirements from such application areas for IoT systems.
2. will be able to explain the state-of-the-art IoT solutions, and understand the basic technologies behind them.
3. learn the principles of the novel IoT technologies and know important directions IoT research towards.

Contents:

The basic technologies and novel applications of the Internet of Things, including networking technologies as well as Web of Things. IoT sensor technologies and sensing solutions for smart buildings including smart home, city, office, or campus environments, and wearables and other personal devices such as fabrication. Exercises will include hands-on programming and sensing data analytics tasks.

Mode of delivery:

face-to-face teaching and exercises (both individual and group work)

Learning activities and teaching methods:

20h lectures, 12h exercise sessions, independent studying 95 hours.

Target group:

M.Sc. students of Computer Science and Engineering, M. Sc. students of Ubicomp International master program. The course fits also for Statistics and Math MSc student interested in applying their knowledge into sensing and IoT data.

Prerequisites and co-requisites:

The Bachelor level knowledge of Computer science and engineering study programmes. Good programming skills in a chosen language.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out, complementary reading list, and exercise material will be provided.

Assessment methods and criteria:

Attending lectures and exercise sessions, and returning the weekly exercises online.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Ella Peltonen

Working life cooperation:

The course may include the invited guest lectures from industry and other top EU universities.

Other information:

Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi

521348S: Statistical Signal Processing 1, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Lehtomäki, Juntti, Markku Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

521484A	Statistical Signal Processing	5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 1st semester of the master studies.

Learning outcomes:

Upon completion the student

1. knows the key tools of linear algebra and optimization and can apply them in solving signal processing problems.
2. understands the key concepts in estimation theory such as the classical and Bayesian framework.
3. masters the most important estimation principles such as minimum variance, maximum likelihood, least squares and minimum mean square error estimators.
4. can derive an estimator for a given criterion and basic data models.
5. can use the methodology of estimation theory to analyze the performance of estimators

6. understands the basics of detection and classification theory: hypothesis testing, receiver operating characteristics (ROC), matched filtering, estimator-correlator

Contents:

Review of probability, linear algebra, random variables and stochastic processes; SVD (Singular value decomposition), QR decomposition, estimation theory, minimum variance unbiased estimator, Cramer-Rao lower bound, linear models, general minimum variance unbiased estimation, best linear unbiased estimators, maximum likelihood estimation, least squares estimation, Bayesian estimation, linear Bayesian estimation, Wiener filters, statistical decision theory, receiver operating characteristics, hypothesis testing, matched filter, estimator-correlator.

Mode of delivery:

Face-to-face teaching and e-learning tool usage

Learning activities and teaching methods:

Face-to-face-teaching (lectures and exercises) 50h, Matlab simulation exercises in groups 30 h, independent work & passed assignment 50 h.

Target group:

Electrical, communications and computer science and engineering students.

Prerequisites and co-requisites:

The required prerequisite is the completion of the following courses prior to enrolling for the course: 031080A Signal Analysis, 031021P Probability and Mathematical Statistics, 031078P Matrix Algebra, 521330A Telecommunication Engineering.

Recommended optional programme components:

521323S Wireless communications I and 031051S Numerical Matrix Analysis are recommended to be taken in parallel.

Recommended or required reading:

Parts from books:
1. Steven M Kay, "Fundamentals of statistical signal processing, volume I: estimation theory." Prentice Hall 1993.
2. Steven M. Kay, "Fundamentals of statistical signal processing: Detection theory, vol. 2." Prentice Hall 1999.
3. Umberto Spagnolini, Statistical Signal Processing in Engineering 2017.
4. Paolo Prandoni & Martin Vetterli, Martin, “Signal Processing for Communications”, CRC Press 2008.
5. Other literature, lecture notes and material.

Assessment methods and criteria:

Completing the simulation project tasks, and a mid-term exam during the course. The mid-term exams can be retaken by a final exam later. In the final grade of the course, the weight for the examination is 0.7 and that of project report 0.3.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero (0) stands for a fail.

Person responsible:

Janne Lehtomäki and Markku Juntti

Working life cooperation:

No

Other information:

-

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440264: Complementary Module, Mining Technology and Mineral Processing, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

493300A: Principles of mineral processing, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Saija Luukkanen
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

ay493300A	Principles of mineral processing (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish; material mainly in English

Timing:

2nd period in the autumn. Recommended for the 3rd year students.

Learning outcomes:

Upon completion the course the student can explain the main unit process used in ore beneficiation and understands teh main chemical and mineralogical factors palying the key role in process development. The student is able to calculate the most relevant process related calculations, such as mass balances, concentrate recoveris and grindability. The student is aware of the environmental as well as H&S aspects of mineral processing.

Contents:

The main unit processes used in mineral processing. Understanding how the mineralogy and chemistry of the ore influences in the process development.

Mode of delivery:

Mainly face-to-face teaching

Learning activities and teaching methods:

Lectures, demonstrations, assignments

Target group:

Student with mineral processing as major; students of mining engineering, geosciences and process engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

The material provided during the course. B.A. Wills: Mineral processing technology

Assessment methods and criteria:

Final exam, home works and practicals, energy

Grading:

1-5/fail

Person responsible:

Saija Luukkanen

Working life cooperation:

No

Other information:

-

493302A: Chemical phenomena in mineral processes, 5 op

Voimassaolo: 01.08.2016 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Saija Luukkanen
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish, course material in English

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course at the 3rd spring semester

Learning outcomes:

Upon succesfull completion student can explain physical-chemical phenomenons (especially surface and electro chemical) affecting various unit operations in mineral processing. Student can also describe general phases in mineral processing and unit operation from standpoint of physical chemistry.

Contents:

Basic equations in thermodynamics; chemical interactions especially in interfaces; electrochemical interactions.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

32 h lectures and practicals

Target group:

Major students in Mining engineering and mineral processing, minor subject students in Geosciences and Process engineering.

Prerequisites and co-requisites:

493300A Principles of Mineral Processing

Recommended optional programme components:

-

Recommended or required reading:

Lecture and electronic material

Assessment methods and criteria:

Final exam, practicals, activity

Grading:

1-5/fail

Person responsible:

Saija Luukkanen

Working life cooperation:

No

Other information:

-

772335A: Introduction to ore mineralogy, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Shenghong Yang, Eero Hanski
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS

Language of instruction:

The language of instruction is English.

Timing:

The course is held in the autumn semester, during period I. It is recommended to complete the course at the 2nd or 3rd autumn semester.

Learning outcomes:

Upon completion of this course, the student will:
obtain basic knowledge on ore minerals and their mode of occurrence
learn to recognise the most common ore minerals and textures under the ore microscope.

Contents:

Division and structure of ore minerals, composition and texture, phase diagrams and their applications. Ore microscope and how it is used, microscopic properties of ore minerals. Identification of ore minerals and ore mineral assemblages.

Mode of delivery:

Face to face teaching.

Learning activities and teaching methods:

14 h lectures, 21 h exercises.

Target group:

All students in geosciences and mining engineering and mineral processing.

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: 771102P Basic mineralogy, 772339A Optical mineralogy.

Recommended optional programme components:

The course in an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Textbook: Craig, J.P. & Vaughan, D.J. (1994) Ore Microscopy and Ore Petrography. Wiley & Sons, 2nd ed. 434 p.
Other handbook-type literature supporting the microscope excercises: Wiley & Sons, 2nd ed. 434 p. Ramdohr, P. (1980) The Ore Minerals and their Intergrowths, vol. 1 and 2. Pergamon Press, 1205 p. Spry P.G. & Gedlinski B.L. (1987) Tables for Determination of Common Opaque Minerals. Economic Geology Publishing Co. 52 p. Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed. 992 p. Nesse W.D. (2012) Introduction to Mineralogy, Oxford University Press. 480 p. Pracejus B. (2008) The ore minerals under the microscope – An optical guide. Atlases in Geosciences 3, Elsevier, 875 p.
The availability of the textbooks can be checked via this link.

Assessment methods and criteria:

Examinations in both theory and calculations.

Grading:

In the theory exam grade and final grade, the course utilizes a numerical grading scale of 1-5. Zero stands for a fail. In the microscope exam, the course utilizes verbal grading pass/fail.

Person responsible:

Shenghong Yang

Working life cooperation:

No.

493605S: Ore benefication technologies, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English, Finnish

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period II. It is recommended to complete the course at the 1st autumn semester

Learning outcomes:

Upon completion of the course students should be able to:

- Describe the principles and applications of the main mineral processing technologies
- Describe the variables effecting on the selection of the process technique and evaluate the most suitable technique for processing different types of materials based on their composition
- Understand the nature of the feed material and its influence in process selection, mineral processing technologies used in selected cases and process optimization
- Use design and optimization methods for applying in beneficiation plants

Contents:

Contents:

- Module 1: Introduction to minerals and mineralogy
- Module 2: Introduction to Mineral Processing Technology
- Module 3: Comminution - Size reduction
- Module 4: Beneficiation Technologies - Physical separation techniques
- Module 5: Physic-chemical separation techniques
- Module 6: Solid Liquid Separation
- Module 7 Case study of optimization

- Module 8: Seminar (assignment, laboratory work and findings in paper review)

Additionally it is included
Practice Ore characterization in optical microscopy
Laboratory test in crushing and grinding, PSD
Laboratory test of flotation
Laboratory test of sedimentation

Mode of delivery:

Classroom education, face to face teaching

Learning activities and teaching methods:

Lectures during one period.
Lectures 36 h / Laboratory tests 8 h/Group work 16 h/Self-study includes exercises and assignments 75 h

Target group:

Mineral processing majors, minor subject students and other form Oulu Mining School and Technology

Prerequisites and co-requisites:

493300A Principles in Mineral Processing, 493302A Chemical Phenomena in Mineral processing

Recommended optional programme components:

The course is an independent entity and does not require additional studies out at the same time

Recommended or required reading:

Wills & Napier-Munn: Mineral processing technology; Elsevier Science & Technology Books, ISBN: 0750644508
Gupta, A., Yan, D.S. (2006). Mineral Processing Design and Operation and Introduction
Articles and references given during the course

Assessment methods and criteria:

Continuous assessment during lectures, exercises, seminar, reports, papers review. Major students participate in a seminar peer review as the assessment method.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Maria Sinche Gonzalez

Working life cooperation:

No

Other information:

Due to continuous assessment used in this course, it is highly recommended that the students are present already in the first lecture.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440255: Supplementary Module, Mechanical Engineering, 20 - 30 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Supplementary Module

Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common courses

462107A: Maintenance of machines, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jouni Laurila
Opintokohteen kielet: Finnish
Leikkaavuudet:

464087A-01 Maintenancy Technology, examination 0.0 op
464087A-02 Maintenancy Technology, exercise work 0.0 op
464087A Maintenancy Technology 5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 3rd spring semester.

Learning outcomes:

Upon completion of the course, the student knows the different types of maintenance execution and can introduce what kind of points are connected to the choice of the maintenance strategy. The student knows the most common machine failure modes and consequences of them and can tell how the failures can be prevented. The student will recognize the effects of wearing and lubrication on the condition of machines and he/she is capable of explaining the basic concepts related to analysis of lubricants. The student knows the basics of the vibration measurement which are used in the condition monitoring of machines and can choose the suitable measuring and analysis methods for the identification of the most common machine faults. The student is familiar with the significance of maintenance in the productional operation and he/she is able to apply the most important standards of the maintenance field.

Contents:

Maintenance strategies and organizing methods, standards of this field, failure modes, wearing and lubrication, basics and the most general methods of machine condition monitoring

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 24 h / group work 36 h / self-study 75 h

Target group:

Bachelor's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462103A Introduction to Maintenance

Recommended optional programme components:

The course is an independent entity

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Järviö, J. et al., Kunnossapito. Helsinki, KP-Media Oy / Kunnossapitoyhdistys ry 2007. Antila, K., et al., Teollisuusvoitelu, KP-Media Oy, 2003. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jouni Laurila

462109S: Simulation and modelling of machines, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462055S-01	Virtual Engineering of Mechatronic Products, examination	0.0 op
462055S-02	Virtual Engineering of Mechatronic Products, exercise work	0.0 op
462055S	Virtual Engineering of Mechatronic Products	5.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 4th spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to create a simulation model consisting of rigid bodies using Adams and MATLAB/Simulink software. The student is able to interpret the simulation results and is also able to evaluate the validity of the results. The student is able to design submodels of complex systems and he/she is able to explain the principles of creating a more complex simulation model. In addition to this, the student is able to evaluate the extent of modelling process of various kinds of engineering systems.

Contents:

Basics of virtual design; ADAMS simulation software principles and basic usage; Creation and usage of multibody systems comprised of rigid bodies; Kinematic and dynamic analysis; Determination of actuator motion paths and velocities as well as determination of loads; Modelling and simulation of control systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 32 h / Self-study 149 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture handout. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

521043S: Internet of Things, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ella Peltonen

Opintokohteen kielet: English

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

English

Timing:

Spring semester during period IV

Learning outcomes:

Upon completion of the course, the student will be able to:
1. explain application areas of IoT and requirements from such application areas for IoT systems.
2. will be able to explain the state-of-the-art IoT solutions, and understand the basic technologies behind them.
3. learn the principles of the novel IoT technologies and know important directions IoT research towards.

Contents:

The basic technologies and novel applications of the Internet of Things, including networking technologies as well as Web of Things. IoT sensor technologies and sensing solutions for smart buildings including smart home, city, office, or campus environments, and wearables and other personal devices such as fabrication. Exercises will include hands-on programming and sensing data analytics tasks.

Mode of delivery:

face-to-face teaching and exercises (both individual and group work)

Learning activities and teaching methods:

20h lectures, 12h exercise sessions, independent studying 95 hours.

Target group:

M.Sc. students of Computer Science and Engineering, M. Sc. students of Ubicomp International master program. The course fits also for Statistics and Math MSc student interested in applying their knowledge into sensing and IoT data.

Prerequisites and co-requisites:

The Bachelor level knowledge of Computer science and engineering study programmes. Good programming skills in a chosen language.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out, complementary reading list, and exercise material will be provided.

Assessment methods and criteria:

Attending lectures and exercise sessions, and returning the weekly exercises online.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Ella Peltonen

Working life cooperation:

The course may include the invited guest lectures from industry and other top EU universities.

Other information:

Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi

Machine Design

462103A: Introduction to Maintenance, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the most important terms related to the field of maintenance, define what the maintenance is and to tell how it affects on productivity, safety and environment. After the course, the student is able to calculate the most important factors and indicators related to the reliability and classify maintenance actions to corrective and predictive operations. In addition, he/she knows how the maintenance must to take into consideration during different planning tasks.

Contents:

The basic concepts, objectives and effects of the maintenance

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h / group work 20 h / self-study 83 h

Target group:

Bachelor's degree students in the mechanical engineering

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Järviö, J. et al., Kunnossapito. Helsinki, KP-Media Oy / Kunnossapitoyhdistys ry 2007.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462101A: Information technology and machines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain how the information technology is utilized in modern machines. The student is able to describe how the modern machines are developed from purely mechanical systems to multi-disciplinary systems. The student is able to sort out the electrical, information technological and mechanical features of modern machines. He/she is also able to describe the interaction and interfaces of the aforementioned features. In addition to this, the student is able to separate the digital and analog domains. The student is able to create a simple computer program for machine control. He/she is able to name the sensors and actuators being used in automated machines. Furthermore, the student is able to list examples of machines taking advantage of modern information technology.

Contents:

History of mechanical engineering and information technology; Information technology as an enabler of the development of machines; Requirements and boundary conditions for automatisation of machines; Concepts of information technology and electronics; Basics of programming and logical reasoning; Examples of machine applications taking advantage of modern information technology.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 20 h / Group work 12 h / Self-study 101 h

Target group:

Bachelor's degree students of mechanical engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are exercises and intermediate exams. The exercises and the exams will be assessed. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the role of actuators in a typical machine automation system. The student is able to recognize various kinds of actuators and is able to classify them according to performance and usability. In addition to this, the student is able to design a simple hydraulic drive and is he/she is able to select a suitable actuator for a typical automation application. Furthermore, the student is able to assess actuator sensing needs and preconditions to work as a part of automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Yrjö Louhisalmi

464105S: Computer aided design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Korpela

Opintokohteen kielet: Finnish

Leikkaavuudet:

462044S-01 Computer Aided Design, examination 0.0 op

462044S-02 Computer Aided Design, exercise work 0.0 op

462044S Computer Aided Design 3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures and exercises arranged spring during periods 3.

Learning outcomes:

The aim of the course is to teach for students how the computer systems are used in different fields of mechanical machine design. After the course, the student is able to define whatcomputer systems belong to the customer centered computer integrated manufacturing. He/she is able to explain what design knowledge is produced in these systems and what design knowledge is transferred between these systems. The student is able to use the CAD/CAM system used in the course in different fields of mechanical machine design.

Contents:

The course will focus on the use of computer systems in different fields of mechanical machine design. The emphasis is on the utilization of product data and the realization of product based design systems, where there is often a need to integrate many systems functionally together

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h / exercises 30 h / practical work 83 h

Target group:

4th year master degree student of mechanical engineering.

Prerequisites and co-requisites:

Machine Drawing and CAD, Design of Machine Elements.

Recommended or required reading:

Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, Inc.: New York, 1999, 581 s.

Assessment methods and criteria:

Final exam and practical work. Final exam will be 40% and practical work 60% of final grade.

Grading:

: Numerical grading scale 1-5 / fail

Person responsible:

University Lecturer Tapio Korpela

462105A: Machine Sensor Technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462053A	Sensor Technology of Machine Automation	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able identify, classify and bring into use the most common sensor types used in machine automation. The student is able to choose sensors for typical automation applications. In addition to this, the student is able to design a common analog and digital signal transmission and conditioning chain.

Contents:

Basics measuring systems; Classification of sensors; Characteristics of analog and digital domain; Analog to digital conversion; Basics of analog signal conditioning: amplification, attenuation and filtering; Operating principle of digital sensors; Examples of typical sensors used in mechanical engineering and civil engineering;

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p. Chapters 4-7; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462111S: Machine diagnostics, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464088S	Diagnosis of Machine Condition	8.0 op
464088S-01	Diagnosis of Machine Condition, examination	0.0 op
464088S-02	Diagnosis of Machine Condition, exercises	0.0 op

ECTS Credits:

10 ECTS credits / 267 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 4th spring semester.

Learning outcomes:

: Upon completion of the course, the student is capable to utilize the different methods of the machine diagnostics and use the most common measuring devices in the finding out the operation and condition of machines. He/she is able to apply the most important features and signal processing methods which are used in the condition monitoring and he/she can analyse the frequency contents of signals to clarify the problems which are related to the operation of machines. The student is able to draw up a measurement plan, carry out the measurements and report the obtained results. The student can use the standards of this field as help in the evaluation of the condition of machines and severity of vibrations. He/she is able to perceive what kind of significance the machine diagnostics has to the success of the maintenance and productivity.

Contents:

The most important methods and measuring techniques which are used in the machine diagnostics, the analysis of machine vibration and faults diagnosis, the most important signal processing methods, measurement planning, realisation and reporting, dynamic balancing of machines, standards of this field

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462107A Maintenance of Machines

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3 – Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jouni Laurila

Mechatronics

521077P: Introduction to Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521077P Introduction to Electronics (OPEN UNI) 5.0 op

521209A Electronics Components and Materials 2.0 op

ECTS Credits:

5 ECTS credits / 132,5 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the 1st period. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

1. Student understands the block structures of electronic devices and their signal processing paths.

2. Student can identify the interfaces of analog and digital electronics and the software operations.

3. Student is able to identify and classify electronics components and compare their properties.

4. Students can describe electric conductivity and apply the phenomenon on designing and choosing resistors

5. Student is able to estimate the difference between dielectric materials and how they affect the properties of a capacitor.

6. Student can compare properties of magnetic materials and how identify they effect on inductive components.

7. Student can identify semiconductivity and is able to list typical semiconductor components.

8. Student can classify different circuit board techniques and is able to choose proper coupling techniques.

9. Student can identify the future technologies of electronics materials.

Contents:

Structures and interfaces of electronic devices. Electromagnetic properties of materials (conductivity, dielectricity, magnetism and semiconductivity).Electronics components (resistors, capacitors, inductive components and semiconductors). Interconnection technologies and circuit board technologies. The future of electronic materials and application areas.

Mode of delivery:

Face-to-face teaching and independent work.

Learning activities and teaching methods:

The implementation methods of the course vary. The course will be arranged utilizing activating teaching methods agreed on together with the students. There will be 48 hours of guided teaching events and 84.5 hours of teaching without guidance either privately or in a group.

Target group:

First year electrical engineering students.

Prerequisites and co-requisites:

No prerequisites.

Recommended optional programme components:

-

Recommended or required reading:

Lecture material; Materials science and engineering: an introduction / Willam D. Callister, chapters 1, 18 and 20; Electronic components and technology / S. J. Sangwine. Chapters 1,2,3,5 and 7

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are two intermediate exams. In addition students will make course work which are graded. The assessment of the course is based on the learning outcomes of the course. Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jari Hannu

Working life cooperation:

No

Other information:

-

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Spring, period 4

Learning outcomes:

After the course the student can

1. write and solve the equations describing the operation of a given electrical circuit

2. solve the sinusoidal steady-state solution using complex phasor arithmetics

3. solve time responses of electric circuits

4. simplify electrical circuits e.g. using equivalent circuits

5. simulate simple circuits and choose an appropriate circuit simulation method

Contents:

Equation of basic circuit elements, circuit laws and systematic building of network equations. Calculation of time and frequency responses. Use of complex phasor arithmetics. Basics of the use of circuit simulators.

Mode of delivery:

Classroom.

Learning activities and teaching methods:

30h lectures, 22h exercises, and a simulation exercise.

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Matrix algebra, complex arithmetics, differential equations.

Recommended optional programme components:

Background to all analog electronics cources.

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 1-11.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed
Read more about assessment criteria at the University of Oulu webpage..

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

461106A: Dynamics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461018A-01	Dynamics, examination	0.0 op
461018A-02	Dynamics, exercises	0.0 op
461018A	Dynamics	4.0 op

ECTS Credits:

5 ECTS credits / 120 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 2st spring semester.

Learning outcomes:

The aim of this course is to provide students with the ability to examine the relationship between the forces on a solid body and the resulting motion, position, speed and acceleration of the body. Learning outcomes: Upon completing the required coursework, the student knows and is able to explain the fundamental quantities and the base laws of the classical mechanics. He/she is able to choose an appropriate coordinate system and analyze the motion - position, velocity, and acceleration - of the parts of a device. The student is able to draw a free body diagram of a moving system, and compose and derive the equations of motion for a system using the direct momentum method, the work-energy method, and the impulse-momentum method.

Contents:

Introduction; Kinematics of a particle; Plane kinematics of a rigid body; Kinetics of a particl;. Basics of mechanical vibrations; Kinetics of a system of particles; Plane kinetics of a rigid body.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 45 h / Exercise 30 h / Self-study 45 h.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T. (2003) Dynamiikka 1, kinematiikka, Pressus; Salmi, T. (2002) Dynamiikka 2, kinetiikka, 2. p., Pressus. Oheiskirjallisuus: Salonen, E.M. (2000) Dynamiikka I, 8. korj. p., Otatieto; Salonen, E.M. (1999) Dynamiikka II, 8. korj. p., Otatieto; Beer, F., Johnston, E.(2007) Vector Mechanics for Dynamics, 9.ed., McGraw-Hill

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are three intermediate exams. In addition to this, the students will be asked to calculate homeworks, and theses homeworks will be assessed. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Optima Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer Hannu Koivurova

462110S: Advanced course in mechatronics, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462052S	Advanced Course in Mechatronics	8.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to analyze and design mechatronic products using modern calculation and simulation methods. The student is able to choose the appropriate technology for a mechatronic system. He/she is also able to compare the various technologies. In addition to this, the student is able to assess the feasibility, performance and preconditions of different kinds of actuators in mechatronic products.

Contents:

Technology of digital control systems; Characteristics of dynamical systems and their behavior in time and frequency domain; Modelling and simulation of mechatronic systems; Basics of advanced vibration damping systems and their control; Modelling of friction; Experimental research of mechatronic systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 16 h / Group work 32 h / Self-study 165 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation, Mechatronics, Simulation and Modelling of Machines

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars, assignment and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

521160P: Introduction to Artificial Intelligence, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Olli Silven

Opintokohteen kielet: English

Leikkaavuudet:

ay521160P	Introduction to Artificial Intelligence (OPEN UNIV)	5.0 op

ECTS Credits:

5 ECTS credits /135 hours of work

Language of instruction:

The language of instruction is Finnish with part of the material in English. The course is implemented as exercises done by groups of participants.

Timing:

The course is held during the period IV in the Spring semester, and it is recommended for the 1st or 2nd year.

Learning outcomes:

Upon completion the student the student will have the elementary skills to identify the potentially applicable artificial intelligence techniques for solving problems. He/she is able to recognize search, regression, classification, and clustering problems, and to explain the use of supervised and nonsupervised learning, performance measurements and metrics.

Contents:

1. Introduction: the role of artificial intelligence
2. Search methods: artificial intelligence in games
3. Regression methods: learning of causalities
4. Classication methods: recognition of categories
5. Clustering methods: identification of category structure
6. Supervised learning
7. Unsupervised learning

Mode of delivery:

The course is implemented face-to-face teaching

Learning activities and teaching methods:

Lectures 42h / group work 70 h / elf-study 23 h. The exercises are completed as group work in multi-disciplinary teams.

Target group:

The course is suitable for all students, but due to the nature of the exercises some elementary programming skills are needed in each student group.

Prerequisites and co-requisites:

No prerequisites

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

The course is modeled loosely based on the University of Washington's Coursera module "Machine learning foundations: a case study approach"

Assessment methods and criteria:

The course utilizes continuous assesment. During the course there are 6 intermediate exams of which 5 best ones will be used in final evaluation. The course includes 5 group exercises of which at least 4 need to be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Olli Silvén

Working life cooperation:

The course includes guest presentations on the artificial intelligence applications

Production engineering

462104A: Machine automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462022S-01 Machine Automation II, examination 0.0 op

462022S-02 Machine Automation II, exercise work 0.0 op

462022S Machine Automation II 5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the basic principles and structures of a typical machine automation system. The student is able to divide an automation system into basic elements and explain their role and significance in the system. The student can apply the basic digital technology and logic methods in designing a typical machine automation system. In addition to this, the student knows the operating principles of programmable logic controllers (PLCs) and is able to implement a logic control for a typical application. Furthermore, the student is able to explain the basic principles of fieldbuses.

Contents:

Basics of automation; Basics of digital technology and logic; Description of operation sequences; Architecture of programmable logic controllers and their programming; Distributed systems and fieldbuses.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. However, it is recommended to complete the course Machine Sensor Technology simultaneously.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Yrjö Louhisalmi

463104A: Advanced manufacturing methods, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463068S-01 Laser Processing, examination 0.0 op

463068S-02 Laser Processing, exercises and seminari 0.0 op

463068S Laser Processing 3.5 op

ECTS Credits:

7 cr / 187 hours of work

Language of instruction:

Finnish, the course can also be completed in English

Timing:

Organized during the autumn semester. Lectures and seminar during period 1, demonstrations and practical work during period 2.

Learning outcomes:

The student can apply laser machining processes, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes in today's machine shops as well as choose suitable equipment for various applications. The student can also describe the main features, capabilities, limitations and trends of the aforementioned processes.

Contents:

Classes and seminars deal with the fundamentals and equipment of laser material processing, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes. Other processes may be added as deemed suitable. Material interaction, process and equipment possibilities and limitations. Additionally, safety and health aspects of the processes are covered.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures and seminars 46h, preparation for the seminars 34h, demonstrations 10h, practical work as a group project 70h, final exam 3h and preparation for the exam 24h. The project work is flexible and enables realization of student-initiated project ideas.

Target group:

Mechanical engineering students in their Master's studies, 5th year.

Recommended optional programme components:

Production technology studies in general.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Ion, J.C. Laser Processing of Engineering Material, Elsevier 2005. Steen, W.K. Laser Material Processing, Springer 2003.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.4), seminar and practical work (0.6).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering. Methods covered in the course are alternative or supplementary to traditional manufacturing methods.

463109S: Computer aided manufacturing, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463059S-01 Computer aided manufacturing, examination 0.0 op

463059S-02 Computer aided manufacturing, exercise work 0.0 op

463059S Computer Aided Manufacturing 4.0 op

ECTS Credits:

7 ECTS

Language of instruction:

Finnish

Timing:

Lectures and exercises at period 2.

Learning outcomes:

The aim of this course is for the student to obtain the basic knowledge of computer-assisted manufacturing by lectures, demonstrations and practical projects. After the course the student knows how to utilize computer-aided methods and systems with different manufacturing processes in machine shops. The student can describe the main features, capabilities and limitations of different methods and processes as well as the trends of computer-aided manufacturing. Additionally, the student can apply his/her knowledge to solve practical problems.

Contents:

Application areas and interfaces in integrated, computer-aided manufacturing of mechanical parts; programming and simulating numerically controlled (NC) production machinery and processes; creating and processing of control information in NC manufacturing. Integration between NC-machine tools, NC-programming systems and manufacturing systems. Flexible manufacturing. Product data management. Analyzing and compensation of machining errors. Methods for surface and shape measuring. Methods, processes and control of rapid manufacturing. In project section of the course the knowledge is applied to solve practical problems in manufacturing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises.

Prerequisites and co-requisites:

463102A Production Technology I.

Recommended or required reading:

Course notes (mainly in Finnish); Contemporary articles and publications. Supplementary material will be given during the lectures. Reference reading: Chang, T-C. & al. Computer-aided manufacturing, Prentice Hall, 2006. Dowden, J.M.The Mathematics of Thermal Modeling, Chapman & Hall, 2001. Hosford, W.F. & Caddel, R.M. Metal forming, Cambridge University Press, 2007 Ion, J.C. Laser processing of engineering materials, Elsevier, 2005, 556 p. Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, 1999, 432 p.

Assessment methods and criteria:

Final exam.The final grade is based on the combined points from the exam (grade 0.6) and exercises (grade 0.4).

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440249: Supplementary Module, Process Engineering, 20 - 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Process engineering

477304A: Separation Processes, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Muurinen, Esa Ilmari
Opintokohteen kielet: Finnish
Leikkaavuudet:

470323A	Separation Processes	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work.

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in autumn semester during the 2nd period. It is recommended to complete the course on the third (Bachelor's) autumn semester.

Learning outcomes:

After the course the student is able to define the position of separation processes based on mass transfer in process and environmental engineering. He/she is capable of solving phase equilibrium problems in multistage separations for binary mixtures. The student is able to explain the phenomena behind the following separation processes: distillation, absorption, stripping, liquid-liquid extraction, supercritical extraction, crystallisation, adsorption, chromatography separation, membrane separations, and reactive separations. He/she recognises the equipment used for these processes and is able to compare the methods to each other with heuristic rules.

Contents:

Separation processes based on mass transfer in process and environmental engineering. Phase equilibrium problems in multistage separations for binary mixtures. Phenomena behind the following separation processes: distillation, absorption, stripping, liquid-liquid extraction, supercritical extraction, crystallisation, adsorption, chromatography separation, membrane separations, and reactive separations. Equipment used for these processes and is able to compare the methods to each other with heuristic rules, etc.

Mode of delivery:

Face-to-face teaching in Finnish. Book examination possible in English.

Learning activities and teaching methods:

Lectures 40 h, exercises 20 h, homework 15 h and self-study 58 h. For foreign students written examination based on given literature and homework.

Target group:

Bachelor's degree students of process and environmental engineering.

Prerequisites and co-requisites:

Courses 477301A Momentum Transfer, 477302A Heat Transfer and 477303A Mass Transfer or 477052A Fluid Mechanics and 477312A Heat and Mass Transfer are recommended beforehand.

Recommended optional programme components:

This is one of the courses in which physical chemistry is used in the applications of process and environmental engineering. It is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Seader, J.D., Henley, E.J. & Roper, D.K.: Separation Processes Principles. Wiley 2011, 821 p.; Noble, R. D. & Terry, P.A.: Principles of Chemical Separations with Environmental Applications. Cambridge 2004, Cambridge University Press.321 p.

Assessment methods and criteria:

Homework assignments affect the course grade. Examination. The course can be completed with two intermediate exams or one final exam. Homework assignments affect the course grade. Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Laboratory manager Dr Esa Muurinen

Working life cooperation:

No

Other information:

-

477203A: Process Design, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jani Kangas

Opintokohteen kielet: English

Leikkaavuudet:

480310A	Fundamentals of Process Design	5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

Period 4

Learning outcomes:

The student is able to identify the activities of process design and the know-how needed at different design stages. The student is capable of utilising process synthesis and analysis tools for creating a preliminary process concept and pointing out the techno-economic performance of the process concept based on holistic criteria.

Contents:

Acting in process design projects. Safety and environmentally conscious process design. Design tasks from conceptual process design to plant design, especially the methodology applicable for preliminary process and plant design.

Mode of delivery:

Lectures and process design exercises in groups.

Learning activities and teaching methods:

Lectures 30 h, group work 50 h and self-study 50 h.

Target group:

Bachelor students in Process and Environmental Engineering

Prerequisites and co-requisites:

Objectives of 477202A Reactor analysis and 477304A Separation processes

Recommended optional programme components:

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Recommended or required reading:

Lecture handouts, Seider, W.D., Seader, J.D. and Lewin, D.R. Product and process design principles: Synthesis, analysis and evaluation. John Wiley & Sons, 2004. (Parts) ISBN 0-471-21663-1

Assessment methods and criteria:

Combination of a final exam or two midterm exams and group design exercises.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

Scale 0-5

Person responsible:

Dr Jani Kangas

Working life cooperation:

-

Other information:

-

477309S: Process and Environmental Catalysis, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Pitkäaho

Opintokohteen kielet: English

Leikkaavuudet:

470226S	Catalytic Processes	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester, during 1 st period. It is recommended to complete the course at the fourth (1 st Master's) autumn semester.

Learning outcomes:

Student is capable of specifying the process steps in catalyst design, selection and testing. Student is able to explain the most important industrial catalytic processes, the use of catalysts in environmental technology, catalyst research and the significance of an interdisciplinary approach in the preparation, development and use of catalysts. He/she recognizes the connection between catalysis and green chemistry and the role of catalysis in sustainable processes and energy production.

Contents:

Catalyst and catalysis, sustainability. Catalysis in industry. Environmental catalysis.

Mode of delivery:

Lectures including design exercises, face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h, exercises 10 h, homework 20 h, teamwork presentations 10 h, and self-study 53 h.

Target group:

Master's degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

488212A Katalyysin perusteet tai 488309A Biokatalyysi

Recommended optional programme components:

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Recommended or required reading:

Lecture handout; Richardson, J.T.: Principles of Catalyst Development. New York. 1989, 288 pp.; Janssen, F.J.J.G. & van Santen, R.A.: Environmental Catalysis. NIOK, Catalytic Science Series, Vol. 1. 1999. 369 pp. *Additional literature:*Ertl, G., Knözinger, J. & Weitkamp, J.: Handbook of Heterogeneous Catalysis. Vol. 1-5. Weinheim. 1997, 657 p.; Thomas, J.M. & Thomas, W.J.: Principles and Practice of Heterogenous Catalysis. Weinheim 1997. 657 pp.; Somorjai, G.A.: Surface Chemistry and Catalysis. New York 1994, 667 pp.; van Santen, R.A., van Leuwen, P.W.N.M., Mouljin, J.A. & Averill, B.A.: Catalysis: An Integrated Approach, 2nd ed. Studies in Surface Science and Catalysis 123. Amsterdam 1999, Elsevier Sci. B.V. 582 pp.

Assessment methods and criteria:

Written examination and homework.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Satu Pitkäaho and Esa Turpeinen

Working life cooperation:

No

Other information:

-

477204S: Chemical Engineering Thermodynamics, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jani Kangas

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS /135 hours of work

Language of instruction:

Finnish

Timing:

Period 1 (autumn term)

Learning outcomes:

By completing the course the student understands classical thermodynamics from a chemical engineering viewpoint. Especially she/he can explain the pVT behaviour of pure substances and understands the thermodynamic properties of mixtures. The student can classify the thermodynamic models describing, for example, liquid mixtures or electrolytes. The student can select appropriate models for gas, vapour and liquid phases. In addition, the student can solve process models, phase equilibrium and chemical reaction equilibrium problems, and more generally, is able to evaluate chemical processes using thermodynamic analysis tools.

Contents:

Mass and energy balances, pVT behaviour of pure substances, thermodynamic properties of fluids, thermodynamics of electrolytes, chemical reaction equilibrium, vapour/liquid equilibrium, calculation of thermodynamical state functions, thermodynamic analysis of processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 46 h and self-study 87 h

Target group:

Students in the study options Process Design and Chemical Engineering

Prerequisites and co-requisites:

Essential contents of 477401A Thermodynamic equilibria course, or equivalent knowledge on the basic concepts of thermodynamic equilibria.

Recommended or required reading:

Lecture handout. Material given during the lectures. Additional literature, Smith, J.M. & Van Ness, H.C. Introduction to Chemical Engineering Thermodynamics. McGraw-Hill, 1987.

Assessment methods and criteria:

Combination of examinations and exercises

Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Jani Kangas

Working life cooperation:

No

Other information:

-

Process Engineering B

477123S: Chemical processing of biomasses, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: English

Leikkaavuudet:

477104S	Chemical Processing of Biomasses	3.0 op

ECTS Credits:

5 ECTS /133 h of work

Language of instruction:

English

Timing:

Implementation in autumn period 1

Learning outcomes:

Upon completion of the course, a student should be able to explain the value chain of chemical processing of renewable lignocellulosic raw materials to pulp and different end-products. A student is able to identify lignocellulosic raw material sources, their properties, their main components and utilization potential of components. The student also identifies the unit operations of chemical pulping processes, can explain their operational principles and their objectives in the process and their role in end product properties. Besides cellulose fibre production, the student identifies biorefining concepts of chemical pulp components (cellulose, hemicelluloses, lignin and extractives) into high value products; cellulose derivatives, special fibres, nanofibrillar and micronized celluloses, and green chemicals.

Contents:

Lignocellulosic raw materials, fundamentals of chemical pulping, recovering of chemicals in kraft pulping, bleaching of pulp. High value biomass products by biorefining (e.g. nanocelluloses and soluble celluloses).

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

The implementation methods of the course vary. Lectures and exercises max. 36 h, web learning and self-study 97 h. A part of the teaching can be replaced by group work or home work.

Target group:

Students interested in bioeconomy.

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended.

Recommended optional programme components:

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Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, book 6: Chemical pulping Part 1 and Part 2, book 20: Biorefining of Forest Resources. Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

This course utilizes continuous assessment including intermediate exam with web learning and homework. Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

A visit/excursion to the local pulp mill and/or visiting lecturers from the industry, when feasible.

Other information:

-

477124S: Mechanical processing of biomasses, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: English

Leikkaavuudet:

477105S	Mechanical Processing of Biomasses	3.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

English

Timing:

Implementation in autumn period 2

Learning outcomes:

Upon completion of the course, a student should be able to explain the value chain of mechanical and chemimechmical processing of renewable lignocellulosic raw materials. Upon completion of the course, a student should be able to identify the unit operations of mechanical and chemi-mechanical pulping process and can explain their operational principles. The student can evaluate the raw material properties and importance of different unit processes on the quality of the end products. In addition, the student can compare fibre properties of different mechanical and chemi-mechanical pulps and wood powders and can explain their effects on the quality of the end product. Student can explain production principle of engineered wood, biocomposites and pelletizing.

Contents:

Processing of wood, mechanical fibres, wood powders: raw material properties, mechanical and chemimechanical defibering, screening, bleaching, biomass micronization and pulverization, the production of engineered wood, wood-plastic composites and pellets. End product properties.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

The implementation methods of the course vary. Lectures and exercises max. 34 h, web learning and self-study 99 h. A part of the teaching can be replaced by group work or home work.

Target group:

Students interested in bioeconomy

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended

Recommended optional programme components:

-

Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, book 5: Mechanical Pulping. Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

This course utilizes continuous assessment including intermediate exam(s) with potential web learning and homework. Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

Visiting lecturers from the industry and/or a visit/excursion to a local manufacturing site, when feasible.

Other information:

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477126S: Manufacturing of fibre products, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477107S	Paper Manufacture	3.0 op
477106S	Recycled Fiber Processes	3.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish.

Timing:

Implementation in spring period 4

Learning outcomes:

Upon completion of the course, a student should be able to identify the unit operations paper and board manufacturing and can explain their purpose of use. The student can name the most important chemicals, fillers and coating pigments and can explain their importance in paper and board making. The student can present the essential properties of papermaking fibres, the structure and properties of paper and board, as well as different paper and board grades. The student knows the fundamentals of printing technology and identifies paper properties essential for printing.

Contents:

Properties of fibers, web forming, chemicals in paper manufacture, coating process, structure and properties of paper, paper processing, paper grades, and fundamentals of printing technology.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (in Finnish) 42 h, a written case study as group work, which is presented to course participants, 40 h. Excursion to local paper mill and printing laboratory 3 h. Self-study 48 h.

Target group:

Students interested in bioeconomy.

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended.

Recommended optional programme components:

-

Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, books 8-11, and 13. Lecture materials and other materials that will be announced at the lectures. Separate study material for the English book exam for foreign students.

Assessment methods and criteria:

Examination and other evaluation methods.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

Lecturer from the industry.

Other information:

-

477128S: Circular Bioeconomy, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: English

Leikkaavuudet:

ay477128S	Circular Bioeconomy (OPEN UNI)	5.0 op
477125S	Recycling of bioproducts	5.0 op
477106S	Recycled Fiber Processes	3.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in the spring period 3.

Learning outcomes:

Upon completion of the course, a student should be able to recognize the incentives for the recycling of bioproducts and residues from forest industry. Student is familiarized with circular bioeconomy at the state-of-art level. Student is able to identify the challenges (properties, transportation ect.) of raw materials and their processing, can propose solutions and has ability to review the sustainability of final products.

Contents:

Reuse, recycling and utilization of bioproducts and side streams of forest industry in accordance with principles of circular bioeconomy. The properties and processing of raw material. Novel applications in circular bioeconomy.

Mode of delivery:

Lectures, group meetings and project work.

Learning activities and teaching methods:

Work load in the course is totally 133h. The number of lectures can vary but project working is main activities in the course.

Target group:

Students interested in circular bioeconomy.

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

The assignment and seminar. More information about assessment methods is given during the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

Visiting lecturers from the industry, when feasible.

Other information:

This Course replace course 477125S Recycling of bioproducts, 5 cr.

Autumation engineering

477621A: Control System Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hiltunen, Jukka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

477602A	Control System Analysis	4.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 1 (autumn term)

Learning outcomes:

After completing the course the student can describe the process dynamics with mathematical and graphical methods. The student can independently: form linear process models, analyse linear system stability, Bode diagrams, Routh’s stability criterion and the Jury's test, and evaluate the behavior of processes through time and frequency range specifications.

Contents:

Introduction to Matlab. Laplace-transforms. Transfer functions and block diagrams. Dynamical systems. Time and frequency analysis. System stability.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to process and environmental engineering I, 488010P Introduction to process and environmental engineering II, and 477051A Automation engineering recommended beforehand

Recommended optional programme components:

None

Recommended or required reading:

Materials delivered at the lectures and exercises. Dorf, R. (2010) Modern Control System. 12th ed. Prentice-Hall. 1104 pp. Additional literature: Ogata, K. (2002) Modern Control Engineering. 4th ed. Prentice-Hall. 964 pp., DiStefano, J. (1990) Feedback and Control Systems. 2nd ed. Prentice-Hall. 512 pp.; Ylen; J-P. (1994) Säätötekniikan harjoitustehtäviä. Hakapaino Oy. 252 pp.

Assessment methods and criteria:

Exam and in addition extra points from homeworks

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Lecturer Jukka Hiltunen and university teacher Seppo Honkanen

Working life cooperation:

No

Other information:

-

477622A: Control System Design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ikonen, Mika Enso-Veitikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

477603A	Control System Design	4.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 3 (spring term)

Learning outcomes:

After completing the course the students can apply mathematical and graphical methods to the dynamics of process characterisation and control design. The student can form PID controllers for the process, and tune them and evaluate the closed-loop requirements.

Contents:

Laplace-level vs, time level, poles of the system, closed loop and its design specifications, PID control and tuning, Matlab control designer tool, control design in frequency domain

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to process and environmental engineering I, 488010P Introduction to process and environmental engineering and 477602A Control system analysis recommended beforehand

Recommended optional programme components:

None

Recommended or required reading:

Lecture and exercise handouts. Åström, K & Murray, R. (2009) Feedback Systems, An Introduction for Scientists and Engineers. Princeton University Press, New Jersey, 396 s. Additional literature: Dorf, R (2010) Modern Control Systems. Prentice-Hall, New York, 1104 s., DiStefano, J (1990) Schaum's Outline of Feedback and Control Systems. 2nd ed, McGraw-Hill, 512 s. ja Ylen, J-P (1994) Säätötekniikan harjoitustehtäviä. Hakapaino Oy, 252 s.

Assessment methods and criteria:

Exam

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Professor Enso Ikonen and university teacher Seppo Honkanen

Working life cooperation:

No

Other information:

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477524S: Process Optimization, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477524S Process Optimization (OPEN UNI) 5.0 op

477504S Process Optimization 4.0 op

ECTS Credits:

5 ECTS /135 hours of work

Language of instruction:

English

Timing:

Spring semester, the 3th period. Recommended for 1st year M.Sc. students.

Learning outcomes:

Student can use and apply standard unconstrained and constrained optimization methods. Student can define and identify optimization problems. Student is able to summarize the role of optimization in process engineering.

Contents:

Basic concepts of optimization. Optimization of unconstrained and constrained functions. Linear programming. Trajectory optimization. Hierarchical optimization. Intelligent methods in optimization. Applications in process engineering.

Mode of delivery:

Face-to-face teaching and exercises.

Learning activities and teaching methods:

The amount of guided teaching is 40 hrs. Contact teaching includes, depending on situation, lectures, group work and tutored group work. During self-study time student does independent or group work.

Target group:

M.Sc. students of process and environmental engineering and M.Sc. students interested in process optimization. Exchange and other international students.

Prerequisites and co-requisites:

No prerequisites but basic understanding on numerical methods and process modelling are useful.

Recommended optional programme components:

See prerequisites

Recommended or required reading:

Reading materials. Ray, W.H. & Szekely, J. (1973) Process Optimization with Applications in Metallurgy and Chemical Engineering. John Wiley & Sons.

Assessment methods and criteria:

This course uses continuous assessment that includes solved exercises and lecture exams. Final exam is also possible.

Grading:

The course unit uses a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Aki Sorsa

Working life cooperation:

No

Other information:

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477624S: Control System Methods, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: István Selek

Opintokohteen kielet: Finnish

Leikkaavuudet:

477614S	Control System Methods	3.0 op
477605S	Digital Control Theory	4.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 1 (autumn term)

Learning outcomes:

After completing the course students can identify the problems of the sampled data systems, and know how to apply discrete time methods for systems analysis and control design.

Contents:

1. Control systems design by frequency-response methods. 2. Control systems design in state space methods 3. Sampled data systems: sampling, Z transformation of signals. 4. Discrete-time modelling: difference equation, shift operator, pulse transfer function, polynomial and state-space description. 5. Analysis of discrete-time systems: z-plane, stability. 6. Discrete-time control design strategies: general RST structure, various pole-zero placement control algorithms, minimum-variance control, model-based control, state-space design methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises include guided computer simulations

Target group:

M.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477621A Control system analysis and 477622A Control system design recommended beforehand

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout. Dorf, R. (2010) Modern Control Systems. Prentice-Hall, New York, 1104 s, Ogata, K (2002) Modern Control Engineering. Prentice-Hall, New York, 964 s., Åström, K & Murray, R. (2009) Feedback Systems, An Introduction for Scientists and Engineers. Princeton University Press, New Jersey, 396 s., Landau, I. & Zito, G. (2005) Digital Control Systems, Springer. 485 pp. Åström, K.J. & Wittenmark, B. (1984, 1997) Computer Controlled Systems: Theory and Design. Prentice-Hall International. 544 pp.

Assessment methods and criteria:

Final written exam; to request an exam in English, contact the lecturer via email beforehand.

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

University teacher Seppo Honkanen

Working life cooperation:

No

Other information:

-

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440263: Complementary Module, Civil Engineering, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Structural Engineering

485109A: Numerical methods in structural engineering, 5 op

Voimassaolo: 01.08.2019 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Civil Engineering field
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

485121S	Numerical methods in structural engineering	5.0 op
466103A	Project work in structural engineering	5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Spring semester, periods 3-4

Learning outcomes:

Ability to develop relevant structural designs and calculations using modern computational tools. Ability to present the results of the design both orally and in writing. Knowledge of the properties of different structural models from the viewpoint of structural dimensioning. Understanding of the fundamentals of yield line theory. Ability to determine the plastic limit load of a slab using the yield line theory. Knowledge of the special features of curved shell structures and their implications for structural design.

Contents:

Structural models. Loading. Plates and slabs. Membrane theory of shells. Theory of shell edge effects. Stability.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures, excercises and self study

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction, 466102A Introduction to structural design, 461107A Finite Element Methods I, 461108A Mechanics of materials

Recommended or required reading:

The course material will be distributed during the lectures.

Assessment methods and criteria:

Homework and exercises

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Senior research fellow Antti Niemi

Other information:

This course replaces course 466103A Project work in structural engineering in Academic year 2019-20.

466107S: Design of concrete structures, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Niemi

Opintokohteen kielet: Finnish

Leikkaavuudet:

485106A	Design of concrete structures	5.0 op
460147A	Introduction to Design of Concrete Technology	4.0 op
460147A-01	Introduction to Design of Concrete Technology, examination	0.0 op
460147A-02	Introduction to Design of Concrete Technology, exercise work	0.0 op
460148S	Design of Concrete Structures	4.0 op
460148S-01	Design of Concrete Structures I, examination	0.0 op
460148S-02	Design of Concrete Structures I, exercises	0.0 op

ECTS Credits:

6 ECTS /162 hours

Language of instruction:

Finnish

Timing:

Lectures and exercising on periods 3 and 4.
Course 485106A replaces this course in academic year 2020-2021.

Learning outcomes:

Upon completion of the course, the student will be able to design typical reinforced concrete structures to EN-standards.

Contents:

Strength and strain properties of concrete and reinforcing bars, time dependent properties. Limit state design of concrete beams and columns to EN standards. Service life design. Fire design. Anchoring and joints of reinforcing bars. Design of flanged cross sections, walls and wall like beams, and foundations carrying walls and columns.

Mode of delivery:

face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercising 54 hours including personal and team work. Self-reliant studying and homework 108 hours.

Target group:

Master level students focusing on structural engineering and design.

Prerequisites and co-requisites:

Recommended good skills in: Statics, strength of materials, structural mechanics of beam and plated structures. Basics in concrete technology and structural design.

Recommended or required reading:

Nykyri: BY211 Betonirakenteiden suunnittelun oppikirja, osa 1, 2013 ja osa 2, 2015; Leskelä: By210 Betonirakenteiden suunnittelu ja mitoitus 2008; By60 Suunnitteluohje EC2 osat 1-1 ja 1-2, 2008; EN 1992-1-1, EN 1992-1-2 (ja muut EN-standardit tarvittavilta osin); BY51 Betonirakenteiden käyttöikäsuunnittelu 2007; BY47 Betonirakentamisen laatuohjeet 2007; RIL 229-2-2006 Rakennesuunnittelun asiakirjaohje, Mallipiirustukset ja -laskelmat; By47 Betonirakentamisen laatuohjeet 2007; RIL202-2012 Betonirakenteiden suunnitteluohje. Martin, Purkiss: Concrete design to EN 1992, Elsevier, 2nd ed. 2006. Lecture and exercise materials.

Assessment methods and criteria:

Continuous assessment. The course can be completed by participating in intermediate exams during the course, or in final exam. Assessment criteria are based on the learning outcomes of the course.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Antti Niemi

Other information:

This course will replace course 485106A in Academic year 2020-21.

485108A: Desing of Steel Structures and Steel Construction, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 ects

Language of instruction:

Finnish

Timing:

Periods 1 and 2

Learning outcomes:

After completing the course the student is capable of explaining the crystalline structure of steel material and he understands elasto-plastic material model. He is able to explain the effect of inclusions, heat treatment and welding process to the mechanical properties of a steel material. The student is familiar with fire design of steel structures. He is able to explain common types of corrosion. The student is able to design the most typical joints in a steel frame and he can analyze simple steel structures. He is also able to analyze stability problems and explain the effects of imperfections and second order effects on frame behavior and member forces.

Contents:

The following topics are covered during the course: Ferrous metals and their properties. Principles of Eurocodes. Design of simple steel structure under base loading cases and loading combinations. Corrosion. Design of joints in steel structures. Composite structures with steel member. Section classification. Effective cross-section. Cross-sections with stiffeners. Steel members in bending and axial compression. Buckling, lateral torsional buckling, and torsion.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures, exercises and self-study.

Target group:

Major students in Structural Engineering and Construction Technology, Mashine design, and Engineering Mechancs.

Prerequisites and co-requisites:

466102A Introduction to Structural Design. Key notes in courses Statics, Strength of Materials I, Strength of Materials II, Energy principles and Their Use in Beam Structures, and Plates and Shells and Mechanics of materials

Recommended or required reading:

Lecture notes (in Finnish). Eurocodes 1990-1999.

Assessment methods and criteria:

Three midterm exams or one final exam is required. One design exercise is required.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Matti Kangaspuoskari

Other information:

This course will replace course 466105S Design of Steel Structures in Academic year 2020-21.

485107A: Timber construction and product technology, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

This is new course, which will teach first time in Academic Year 2020-21.

Traffic and road construction engineering

485401A: Basics of Traffic Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

488151A	Basics of Traffic Engineering	5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 1

Learning outcomes:

By completing the course the student knows the basics of modes of transport, the significance of traffic and transportation to society, traffic planning and research methods, transport economics and the external effects of transport.

Contents:

Modes of transport, Need for traffic and transportation, Transport planning and research, Economical and environmental impacts of traffic, Traffic safety.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the Master's Programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

This course will replace course 488151A Basics of Traffic Engineering in Academic year 2019-20.

485402S: Advanced Course in Traffic Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

488152S	Advanced Course in Traffic Engineering	5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 2

Learning outcomes:

By completing the course the student understands the basics of transport policy and the significance of transport economics to society. The student becomes familiar with traffic safety and is able to analyse the problems of traffic safety and opportunity to improve it.

Contents:

Transport policy, transport economics, traffic safety

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the master’s programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488151A Basics of Traffic Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

This course will replace course 488152S Advanced Course in Traffic Engineering in Academic year 2019-20.

485403A: Basics of Road Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Veikko Pekkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

488153A	Basics of Road Engineering	5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 3

Learning outcomes:

By completing the course the student understands the basics of road design and construction, is able to calculate structure layers of road and is familiar with the maintenance of roads

Contents:

Road and street planning and design, lining, roads structure, maintenance of roads, basics of earthworks

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Materials delivered during the lectures

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Veikko Pekkala

Other information:

This course will replace course 488153A Basics of Road Engineering in Academic year 2019-20.

485404S: Road Design and Construction, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Veikko Pekkala

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 4

Learning outcomes:

By completing the course the student is familiar with road structure and function, structural modernisation, pavements and the basics of earthworks. He/she is also able to design road computer aided.

Contents:

Function of road structure, road damaging, structural modernisation, pavements, Road design and construction

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 32 h, self-study 75 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488153A Road Design and Construction, and 488051A AutoCAD and Matlab in process and environmental engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Veikko Pekkala

Other information:

This course will replace course 488154S Road Design and Construction in Academic year 2019-20.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440256: Supplementary Module, Environmental Engineering, 20 - 30 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Supplementary Module

Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Enviromental Engineering A

488209S: Renewable Energy, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Huuhtanen, Mika Ensio
Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 135 hours of work.

Language of instruction:

English

Learning outcomes:

The student is able to define different methods and techniques to generate electricity and heat. He/she is able to explain steam power plant operating principles and is able to compare operation of different kinds of steam power plants. The student can describe the environmental impacts of energy production and is able to compare the environmental impacts of different ways of producing energy. The student is able to identify functioning of the fossil based and renewable energy production systems. He/she is able to explain how the electricity markets work. The student is also able to explain the adequacy of energy reserves.

Contents:

Structure of energy production and consumption. Systems for electric transportation, storing and distribution. Distribution and adequacy of energy resources. Effects of environment contracts on the use of energy resources. Environmental comparison of different energy production methods and fuels. Energy markets. Development views of energy technology.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40h, self-study 95 h

Target group:

Master's degree students of Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

The courses 477011P and 488010P Introduction to Process and Environmental Engineering I and II or 477013P Introduction to Process and Environmental Engineering are recommended.

Recommended optional programme components:

-

Recommended or required reading:

Materials delivered via the Optima environment.

Assessment methods and criteria:

Written final exam.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Mika Huuhtanen

Working life cooperation:

No

Other information:

This course replaces the course 488202S Production and Use of Energy in academic year 2019-2020.

488501S: Smart Grid I: Integrating renewable energy sources, 5 op

Voimassaolo: 01.08.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Eva Pongracz
Opintokohteen kielet: English

ECTS Credits:

5 cr/150 hours of work

Language of instruction:

English

Timing:

Period 2

Learning outcomes:

The student is able to explain the concept of smart grids, the evolution of smart grids from electricity power grids, the information technology requirements as well as the economic, environmental and social implications of smart grids. The student can explain the basic functioning of energy markets in Finland and the Nordic countries as well as the basics of electricity and carbon pricing. The student is also able to find real time data on variable energy sources (VRES) and able to apply the residual curve equation. The student can also explain the costs of large scale VRES integration and how they can be mitigated. The student can also explain demand site flexibility and the need for flexibility services emerging in the smart grid system. The student will know the expectations from smart grids and is able to outline the future perspectives of smart grid-based energy systems. The student is able to draft a scenario for the decarbonization of the energy system by 2050, and assess its economic, environmental and geopolitical implications, as well as the technological and infrastructural gaps.

Contents:

Multidisciplinary course, offered at the Faculty of Technology (Water, Energy and Environmental Engineering research group – WE3), in cooperation with Oulu Business School (OBS, Department of Economics) and the Faculty of Information Technology and Electrical Engineering (Centre of Wireless Communication - CWC).
After an introductory presentation on the requirements, the background is set on the energy and environmental crisis, the co-evolution of energy and information systems and outlining the transition to a smarter system. Further, lectures on smart grids will be provided from an electrical engineering and information technology view on the evolution of electricity power grids, power generation transmission and distribution; distributed generation and futures of smart grids. From an environmental engineering point of view, lectures will be delivered on energy systems fundamentals, climate goals and decarbonization, as well as on the sustainability of smart grids will in particular the environmental and social impacts of smart grids. From economics points of view, lectures will be given on the liberalization and deregulation of the electricity market, electricity pricing, transmission and distribution as natural monopolies, smart grids and new market mechanisms, and the economic impacts of large-scale integration of renewable energy sources. Participation on lectures is not compulsory, but students are to answer to problem questions.

As an exercise, students will be given a group work assignment that they are to work with throughout the duration of the course with the help of mentors. The subjects of the exercise is achieving climate goals and the future of energy systems.

Mode of delivery:

Implemented as face-to-face teaching and student seminar. The course largely relies on participatory learning, therefore, there are compulsory participation requirements.

Learning activities and teaching methods:

Lectures 32 h / student presentations 8 h, Guided group work: 8 h, individual homework 50 h/group work 37 h.

Target group:

Master's students of environmental engineering, especially of energy and environmental engineering orientation; Master's students in economics; Master's students of Electrical Engineering and Information Technology.

Prerequisites and co-requisites:

For Environmental Engineering students, admission to the Master's programme, for which minimally a former bachelor's degree is required. For other students the Bachelor level studies. A minimum of 10 ECTS worth of prior energy studies, bachelor level studies are acceptable. For example at Oulu: 488202S Production and use of energy, 488504S Fundamentals of nuclear energy.

Recommended or required reading:

Will be provided during the course by the lecturers.
Chen-Ching Liu, Stephern McArthur and Seung-Jae Lee (eds.)(2016) Smart Grids handbook, 3 volume set, and Stephen F. Bush (2014): Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. http://onlinelibrary.wiley.com/book/10.1002/9781118820216.

Assessment methods and criteria:

Answering problem questions and group exercise. Compulsory requirements are completing learning portfolio, answering of at least 75% of problem questions, participation in 50% of intermediate presentations and compulsory participation in the final presentation.

Grading:

The course evaluation will be based on an on-line learning portfolio and performance in the exercise participation and exercise report. The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.

Person responsible:

Docent Eva Pongrácz (EEE) and Prof. Maria Kopsakangas-Savolainen (OBS). Other lecturers: EEE: Dr. Antonio Caló, Dr. Jean-Nicolas Louis; OBS: Prof. Rauli Svento, M.Sc. Mari Heikkinen, M.Sc. Hannu Huuki, M.Sc. Santtu Karhinen, M.Sc. Enni Ruokamo; CWC: Dr. Sc. Jussi Haapola.

Other information:

The number of students is limited. This course is a 5 credit course for engineering students, but economics students gain overall 6 credits by doing a mandatory extra assignment which corresponds to 1 credit.

488502S: Smart Grid II: Smart buildings/smart customers in the smart grid, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eva Pongracz

Opintokohteen kielet: English

ECTS Credits:

5 cr/137 hours of work

Language of instruction:

English

Timing:

Period 3

Learning outcomes:

The student is able to explain the concept of smart houses, and is able to demonstrate the optimization of smart house functions for energy efficiency, decarbonization and cost savings. Further, the student is familiar with the concepts and the technologies of smart house automation as well as other technologies used in smart houses such as smart appliances, smart metering and energy storage. The student will also understand the new role of consumers in the smart grid environment, their changing roles as well as current and future models of energy services. The student will also understand the risks of smart houses in terms of cyber security, data privacy and management. In addition, the student is able to outline the future perspectives of smart houses and smart consumers as part of the smart city framework and aiming toward eco-cities of the future.

Contents:

Multidisciplinary course, offered in cooperation of the Faculty of Technology (Energy and Environmental Engineering Research Unit - EEE), Oulu Business School (OBS, Department of Economics) and the Faculty of Information Technology and Electrical Engineering (Centre of Wireless Communication - CWC). After an introductory presentation on the course requirements, the basics are set in terms of defining smart houses as part of smart grids. Further the complementary roles of smart houses for energy efficiency, costs saving and decarbonization is explained. The key technologies of smart houses will be explained and demonstrated, including company presentations on existing commercial technologies and service models. In addition, the new role of consumers as prosumers and service users will be explained and demonstrated. There will be no exam, however, the students are to answer to problem questions related to the lectures and complete the exercises. There will be 4 exercises, concentrating on the 4 key themes of the course: smart house functions, smart house technologies, smart consumers, and energy services. Part of the exercises will be done as individual work that will be reported and some will be performed as group work. There will also be in-class guided exercises.

Mode of delivery:

Implemented as face-to-face teaching, visiting lectures and student presentations. The course largely relies on participatory learning, therefore, there are compulsory participation requirements.

Learning activities and teaching methods:

Lectures 28 h, student presentations 4 h, guided exercise work 24 h, individual work 45 h, group work 34 h.

Target group:

Master's students of environmental engineering, especially of energy systems orientation; Master's students in economics; Master's students of Electrical Engineering and Information Technology. Doctoral students are also welcome to participate.

Prerequisites and co-requisites:

Completing course 488501S is preferred.

Recommended or required reading:

Will be provided during the course by the lecturers.
Chen-Ching Liu, Stephern McArthur and Seung-Jae Lee (eds.)(2016) Smart Grids handbook, 3 volume set, and Stephen F. Bush (2014): Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. http://onlinelibrary.wiley.com/book/10.1002/9781118820216.

Assessment methods and criteria:

Answering problem questions, individual and group exercise. Compulsory requirements are completing learning portfolio, answering of at least 75% of problem questions, compulsory participation in the in-course exercises and participation in the student presentation.

Grading:

The course evaluation will be based on an on-line learning portfolio, exercise performance and exercise report. The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.

Person responsible:

Prof. Eva Pongrácz (EEE) and Prof. Maria Kopsakangas-Savolainen (OBS). Other lecturers: EEE: Dr. Jean-Nicolas Louis; Dr. Antonio Caló, OBS: MSc Enni Ruokamo and MSc Santtu Karhinen.; CWC: Doc. Jussi Haapola.

Other information:

The number of students is limited. This course is a 5 credit course for engineering students, but economics students gain overall 6 credits by doing a mandatory extra assignment which corresponds to 1 credit.

488503S: Smart Grid III: Smart energy networks, 5 op

Voimassaolo: 28.11.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Eva Pongracz
Opintokohteen kielet: English

ECTS Credits:

5 cr/150 hours of work

Language of instruction:

English

Timing:

During period 4 in spring semester

Learning outcomes:

The student is able to explain the concept of energy transition, and is able to outline the structure and functioning of smart energy networks. Further, the student is familiar with the concepts of multiple energy networks, integrating multiple energy networks and networks flow analysis. The student will also understand the concept of swarms of distributed energy generation and the need for storage to ensure network stability. The student will also able to outline the key energy storage methods and will be able to recommend them for distributed vs. centralized storage of both heat and electricity, for long term as well as short term. The student will also be able to use design tools for the planning and evaluation of future energy systems. The student will also be able to assess the dimensions of sustainability of smart energy networks.

Contents:

Multidisciplinary course, offered in cooperation of the Faculty of Technology (Energy and Environmental Engineering Research Unit - EEE), Oulu Business School (OBS, Department of Economics) and the Faculty of Information Technology and Electrical Engineering (Centre of Wireless Communication - CWC). After an introductory presentation on the course requirements, the basics are set in terms of defining energy transition to a carbon neutral energy future. Further the integration of multiple energy networks will be explained, as well as communication within multiple energy networks. The issue of swarms of distributed generation will be explained, as well as the economics of a system relying largely on renewables. The key storage technologies will be explained, demonstrating their use for heat or electricity storage, their effectiveness on small or large scale, as well as their purpose and economics of short and long term storage. Communication within the smart grid as well the economics of distributed generation in a future carbon neutral energy system will be explained. Finally, the sustainability assessment of smart energy network performance will be explained. There will be no exam, however, the students will need to answer to problem questions related to the lectures and complete exercises. There will be 3 exercises, concentrating on (1) evaluation of storage technologies, (2) simulation of future smart energy networks and (3) sustainability assessment. The simulation work will be done as group work using the EnergyPlan freeware, for which in-class guidance will be provided. The results of the simulation will have to be presented. The rest will be done as individual work.

Mode of delivery:

Implemented as face-to-face teaching, visiting lectures and student presentations. The course largely relies on participatory learning, therefore, there are compulsory participation requirements.

Learning activities and teaching methods:

Lectures 28 h, student presentations 4 h, guided exercise work 24 h, individual work 50 h, group work 38 h.

Target group:

Master’s students of environmental engineering, especially of energy and environmental engineering orientation; Master’s students in economics; Master’s students of Electrical Engineering and Information Technology. Doctoral students are also welcome to participate.

Prerequisites and co-requisites:

Completing Smart grids 1 is a prerequisite, completing Smart grids 2 prior to this course is also recommended.

Recommended or required reading:

Will be provided during the course by the lecturers.
Chen-Ching Liu, Stephern McArthur and Seung-Jae Lee (eds.)(2016) Smart Grids handbook, 3 volume set, and Stephen F. Bush (2014): Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. http://onlinelibrary.wiley.com/book/10.1002/9781118820216.

Assessment methods and criteria:

Answering problem questions, individual and group exercise. Compulsory requirements are completing learning portfolio, answering of at least 75% of problem questions, compulsory participation in the in-course exercises and participation in the student presentation.

Grading:

The course evaluation will be based on an on-line learning portfolio, exercise performance and exercise report. The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.

Person responsible:

Prof. Eva Pongrácz (EEE) and Prof. Maria Kopsakangas-Savolainen (OBS). Other lecturers: EEE: Dr. Antonio Caló, Dr. Jean-Nicolas Louis; OBS: Enni Ruokamo; CWC: Dr. Jussi Haapola, MSc. Florian Kühlenz

Other information:

The number of students is limited. This course is a 5 credit course for engineering students, but economics students gain overall 6 credits by doing a mandatory extra assignment which corresponds to 1 credit.

Enviromental engineering B

477309S: Process and Environmental Catalysis, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Pitkäaho

Opintokohteen kielet: English

Leikkaavuudet:

470226S	Catalytic Processes	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester, during 1 st period. It is recommended to complete the course at the fourth (1 st Master's) autumn semester.

Learning outcomes:

Student is capable of specifying the process steps in catalyst design, selection and testing. Student is able to explain the most important industrial catalytic processes, the use of catalysts in environmental technology, catalyst research and the significance of an interdisciplinary approach in the preparation, development and use of catalysts. He/she recognizes the connection between catalysis and green chemistry and the role of catalysis in sustainable processes and energy production.

Contents:

Catalyst and catalysis, sustainability. Catalysis in industry. Environmental catalysis.

Mode of delivery:

Lectures including design exercises, face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h, exercises 10 h, homework 20 h, teamwork presentations 10 h, and self-study 53 h.

Target group:

Master's degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

488212A Katalyysin perusteet tai 488309A Biokatalyysi

Recommended optional programme components:

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Recommended or required reading:

Lecture handout; Richardson, J.T.: Principles of Catalyst Development. New York. 1989, 288 pp.; Janssen, F.J.J.G. & van Santen, R.A.: Environmental Catalysis. NIOK, Catalytic Science Series, Vol. 1. 1999. 369 pp. *Additional literature:* Ertl, G., Knözinger, J. & Weitkamp, J.: Handbook of Heterogeneous Catalysis. Vol. 1-5. Weinheim. 1997, 657 p.; Thomas, J.M. & Thomas, W.J.: Principles and Practice of Heterogenous Catalysis. Weinheim 1997. 657 pp.; Somorjai, G.A.: Surface Chemistry and Catalysis. New York 1994, 667 pp.; van Santen, R.A., van Leuwen, P.W.N.M., Mouljin, J.A. & Averill, B.A.: Catalysis: An Integrated Approach, 2nd ed. Studies in Surface Science and Catalysis 123. Amsterdam 1999, Elsevier Sci. B.V. 582 pp.

Assessment methods and criteria:

Written examination and homework.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Satu Pitkäaho and Esa Turpeinen

Working life cooperation:

No

Other information:

-

488203S: Industrial Ecology, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Väisänen, Virpi Maria

Opintokohteen kielet: English

Leikkaavuudet:

ay488203S	Industrial Ecology and Recycling	5.0 op
480370S	Industrial Ecology and Recycling	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester during 1 st period.

Learning outcomes:

Upon completion of the course, the student will be able to use the tools of industrial ecology and apply them to industrial activity. The student can also analyze the interaction of industrial, natural and socioeconomic systems and able to judiciously suggest changes to industrial practice in order to prevent negative impacts. The student can also analyze the examples of industrial symbioses and eco-industrial parks and able to specify the criteria of success for building eco-industrial parks.

Contents:

Material and energy flows in economic systems and their environmental impacts. Physical, biological and societal framework of industrial ecology. Industrial metabolism, corporate industrial ecology, eco-efficiency, dematerialization. Tools of industrial ecology, such as life-cycle assessment, design for the environment, green chemistry and engineering. Systems-level industrial ecology, industrial symbioses, eco-industrial parks.

Mode of delivery:

Face-to-face teaching in English.

Learning activities and teaching methods:

Lectures 30 h / Group work 30 h / Self-study 75 h. The exercises are completed as guided group work.

Target group:

Master's degree students of process and environmental engineering.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes; Graedel T.E & Allenby B.R.: Industrial Ecology. New Jersey: Prentice Hall, 2003.

Assessment methods and criteria:

All students complete the course in a final exam. Also the exercise will be assessed. The assessment criteria are based on the learning outcomes of the course.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virpi Väisänen

Working life cooperation:

No

Other information:

-

488214S: Air Pollution Control Engineering - Practical Solutions, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Pitkäaho

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester during 2 nd period first time in Autumn term 2021.

Learning outcomes:

Student is able to explain what kind of air emissions originate from different industrial and energy production sectors. Student deepens knowledge obtained in 488213A course and is able to apply it to different practical emission problems. She/he is able to comprehensively describe, choose, design and optimize emission control technologies. Student understands essential regulations and laws concerning emission control.

Contents:

Principles of air pollution control equipment and their use in real applications. Emission control case studies in industry and energy production sector. Air pollution related regulations and laws.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, exercises 12 h, homework 8 h, teamwork presentations 10 h, and self-study 75.

Target group:

Master’s degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

488213A Ilmansuojelutekniikan perusteet

Recommended optional programme components:

-

Recommended or required reading:

Materials in the Optima environment. de Nevers; N.: Air Pollution Control Engineering. 2nd ed. McCraw-Hill 2000. 586 pp
Additional literature: Singh, H. B.: Composition, Chemistry, and Climate of the Atmosphere. New York 1995. 527 pp.; Bretschneider, B. & Kurfurst, J.: Air Pollution Control Technology. Elsevier, Amsterdam 1987. 296 pp.; Hester, R. E. & Harrison, R. M.: Volatile Organic Compound in the Atmosphere. Issues in Environmental Science and Technology. Vol. 4. Bath 1995; Hester, R. E. & Harrison, R. M.: Waste Incineration and the Environment. Issues in Environmental Science and Technology. Vol 4. Bath 1995.

Assessment methods and criteria:

Written final exam or intermediate exams.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi /english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Satu Pitkäaho ja Esa Turpeinen

Working life cooperation:

No.

Other information:

Korvaa lukuvuonna 2019-2020 kurssin 488204S Air Pollution Control Engineering.

488215S: Industry and Environment, 5 op

Voimassaolo: 28.06.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

477334S Industrial activities and environment 5.0 op
ay488215S Industry and Environment (OPEN UNI) 5.0 op
488221S Environmental Load of Industry 5.0 op

488205S Environmental Load of Process Industry 4.0 op

ECTS Credits:

5 cr / 135 hours of work

Language of instruction:

English

Timing:

This course will teach first time in Autumn 2020. This course replaces course 488221S Environmental Load of Industry.

Learning outcomes:

The student is able to identify the essential features of the environmental load in different types of (chemical, wood, metallurgical,...) industry. He/she is able to explain the type, quality, quantity and sources of the emissions. The student is familiarized with the main emission control systems and techniques in different industrial sectors. The student can explain the environmental management system of an industrial plant and is able to apply it to an industrial plant.

Contents:

Effluents: types, quality, quantity, sources. Unit operations in managing effluents, comprehensive effluent treatment. Environmental management systems, environmental licences, environmental reporting and BAT.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h, self-study 93h.

Target group:

Master's degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

The courses 477011P Introduction to Process and Environmental Engineering I, 488011P Introduction to Process and Environmental Engineering II, 488204S Air Pollution Control Engineering and 488110S Water and Wastewater Treatment recommended beforehand.

Recommended or required reading:

Material represented in lectures and in the Optima environment.

Assessment methods and criteria:

Written final exam or a learning diary.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Doctoral student Niina Koivikko

Working life cooperation:

No.

Other information:

The course mainly consists of specific lectures presented by experts who are invited from industry.

This course will teach as online course in Fitech in Spring Term 2020.

Environmental engineering C

488110S: Water and Wastewater Treatment, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480151S	Water and Wastewater Treatment	7.0 op
480208S	Industrial Water and Wastewater Treatment	3.5 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during period 1

Learning outcomes:

Upon completion of the course, the student will be able to understand the theory and practicalities behind the most used purification processes in water and wastewater treatment. The student will also be capable of performing basic dimensioning calculations and therefore he/she will be able to dimension structures/units of water and wastewater treatment plants and to comprehend the basic requirements of different purification processes.

Contents:

Water quality characteristics of source water; basic principles of purification processes (coagulation/flocculation, sedimentation, biological treatment, filtration, disinfection, etc); process units in water and waste water treatment; selection of process units; dimensioning of treatment structures and unit processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h), field visits (5 h), exercises and other assignments (60) and self-study (38 h).

Target group:

Students in Master program of Environmental Engineering and in master program of civil engineering.

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: Introduction to process and environmental engineering (477013P) or I (477011P) and II (488010P)

Recommended optional programme components:

-

Recommended or required reading:

To be provided during the course.

Assessment methods and criteria:

The course can be completed in two different study modes: A) Active mode: midterm exam based on reading material + completion of 2 group exercises + final exam based on lectures and exercises; B) Passive mode (book exam): 100% self-study mode where the student is provided with 2-3 reference books and attends an exam based on the provided material. (Passive mode can be complete under special circunstances)
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Post-doctoral researcher Dr Elisangela Heiderscheidt

Working life cooperation:

Through visits to water and wastewater treatment plants, which include lectures provided by environmental engineers in charge and guided tours, the students familiarize with the main technological and process related principles of the field and have the chance to experience in first hand how to deal with some of the most common issues related to water and wastewater purification systems.

Other information:

-

488134S: Hydrogeology and groundwater engineering, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the spring semester, during period 3

Learning outcomes:

Upon completion of the course, the student will have knowledge on groundwater systems and the basic hydrogeological and engineering concepts involved. This includes analysis of flow in porous media, hydraulics of groundwater systems, groundwater quality and groundwater use. After the course students are able to estimate key factors influencing on groundwater recharge, flow and discharge and to use general methods to calculate groundwater flow.

Contents:

2D and 3D groundwater flow, conceptual models, unsaturated layer flow, water storage and retention, heterogeneity and isotropy, aquifer types, pumping tests, geophysical methods, groundwater quality and resources in Finland

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures (18 h), calculus lectures (12 h), homework, exercises and self-study (103 h).

Target group:

Master students in the water engineering orientation of the Environmental Engineering program and in master program of civil engineering

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit: 488102A Hydrological Processes

Recommended or required reading:

Lecture handouts, Physical and Chemical Hydrogeology (Domenico PA, Schwartz FW, 2nd edition, 1998, ISBN 0-471- 59762-7). Maanalaiset vedet - pohjavesigeologi-an perusteet (Korkka-Niemi K, Salonen V-P, 1996, ISBN 951-29-0825-5). Pohjavesi ja pohjaveden ympäristö (Mälkki E, 1999, ISBN 951-26-4515-7).

Assessment methods and criteria:

exam and/or lecture exams.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Postdoctoral Researcher Pekka Rossi

Working life cooperation:

Students familiarize themselves to a real groundwater aquifer cases discussed in lectures and in the course exercise.

488135S: Water distribution and sewage networks, 5 op

Voimassaolo: 28.11.2016 - 31.07.2019

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: English

Leikkaavuudet:

488144A	Water distribution and sewage networks	5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, in period 2

Learning outcomes:

Student knows and understands the systems and dynamics needed for water distribution and waste water networks. Student is able to do basic dimensioning for water distribution network and sewer system of an urban area.

Contents:

Water distribution and waste water network design and dimensioning, Pumping and storage tanks needed in distribution of water and collection of sewage waters, renovation of pipelines, special circumstances in water distribution, effects of cold climate and harmful hydraulic conditions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h), homework (45 h) and a design exercise (58 h).

Target group:

Students in master program of environmental engineering and in master program of civil engineering

Prerequisites and co-requisites:

Use of AutoCAD-program

Recommended optional programme components:

The recommended prerequisite is the completion of the following course prior to enrolling for the course unit: 477052A Virtaustekniikka, 477312A Lämmön- ja aineensiirto 488102A Hydrological Processes and 488051A AutoCAD ja Matlab prosessi- ja ympäristötekniikan työkaluna or at least equivalent information about water management.

Recommended or required reading:

Lecture handout and other materials delivered in lectures. To the appropriate extent: RIL 237-1-2010 Vesihuoltoverkkojen suunnittelu, RIL 237-2-2010 Vesihuoltoverkkojen suunnittelu, RIL 124-2 Vesihuolto II, Mays Water distribution systems handbook

Assessment methods and criteria:

Exam and a design exercise.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Postdoctoral Researcher Pekka Rossi

Working life cooperation:

Visit to a site of water distribution network buiding site, pumping station or water supply/sewerage company.

488206S: Sustainable Energy Project, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Huuhtanen, Mika Ensio

Opintokohteen kielet: English

Leikkaavuudet:

488410A	Introduction to Sustainable Energy	10.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

English

Timing:

Implementation in spring semester during 3 th and 4 th periods

Learning outcomes:

The student is able to adapt the (skills) tools learned in previous courses to complete an energy production and management design project. The student will solve an engineering problem related to sustainable energy generation in cold climate.The student is able to describe the key practical issues related to sustainable energy generation. The student will evaluate the relevant instruments, tools and measures required for sustainable energy production, distribution, and end-use efficiency. The student will demonstrate the ability to select the proper tools, and methods to solve the design problem. The student will also acquire skills to work as a member in an engineering design project as part of a team. He/she will gain the experience to carry out a real project and produce a documentation of the engineering solution.

Contents:

A design project to adapt small-scale renewable energy production and management, greenhouse gas reduction and/or utilization, wind, solar, and geothermal energy generation. Management of energy efficiency. Energy engineering and design principles. Performance evaluation and sustainability assessment of the selected project. Problem solving.

Mode of delivery:

Team work, group meetings and seminars

Learning activities and teaching methods:

Lectures, design projects in small groups, presentations and reporting.

Target group:

Master’s degree students

Prerequisites and co-requisites:

The course 488202 Production and Use of Energy is a compulsory, and 488203S Industrial Ecology and 477309S Process and Environmental Catalysis courses are recommended prerequisites to the project

Recommended optional programme components:

-

Recommended or required reading:

Materials delivered on lectures and during the group meetings. *Additional literature:* Manuals and databases, depends on the project work selected.

Assessment methods and criteria:

Written report with the documentation of the engineering solution.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Mika Huuhtanen

Working life cooperation:

No

Other information:

-

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

555306M: Elective Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440269: Special Module, 0 - 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Special Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

International students should select 555212P, 030008P and 900017Y

555212P: Orientation Course for New Students, 1 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Leikkaavuudet:

555203P	Study Skills	2.0 op

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Ursula Heinikoski
Opintokohteen kielet: Finnish
Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:

1 ECTS credits / 27 hours of work

Language of instruction:

Finnish

Timing:

Architecture 3. spring semester, period I; Biochemistry 3. autumn semester; Biology 3. autumn semester, period I; Chemistry 3. autumn semester, period II; Computer Science and Engineering 2. spring semester, period IV; Electronics and Communications Engineering 3. spring semester; Geosciences 2. spring semester, period IV; Geography 1. and 3. spring semester, period III; Industrial Engineering and Management 3. year (Master's degree students in Industrial Engineering and Management 1st year.); Information Processing Sciences 1. year; Mathematics and Physics 1. spring semester, period III; Mechanical Engineering 3. year; Mining Engineering and Mineral Processing 3. year; Process and Environmental Engineering 2. year, period II.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information,
- can use the most important databases of their discipline,
- know how to evaluate search results and information sources,
- can use the reference management tool

Contents:

Scientific information retrieval process, the most important databases and publication channels of the discipline, evaluation of the reliability of information sources and RefWorks reference management tool.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises, a group assignment.

Learning activities and teaching methods:

Training sessions 8 h, group working 7 h, self-study 12 h

Target group:

Compulsory for all bachelor degree students of Faculty of Information Technology and Electrical Engineering, Faculty of Technology and Faculty of Science. Compulsory also for those Master's degree students in Industrial Engineering and Management who have no earlier studies in the information skills. Optional for the students of biochemistry.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material Tieteellisen tiedonhankinnan opas http://libguides.oulu.fi/tieteellinentiedonhankinta (in Finnish)

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Ursula Heinikoski

Working life cooperation:

-

Other information:

-

030008P: Information Skills for foreign degree students, 1 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Klintrup, Outi-Mirjami

Opintokohteen kielet: English

ECTS Credits:

1 ECTS credits / 27 hours of work

Language of instruction:

English

Timing:

International students in their 1st academic year, of Master's Degree Programme in Environmental Engineering and Industrial Engineering and Management (Product Management). The course is held once in the autumn semester, during period II and, once in the spring semester, during period IV.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information for their thesis,
- know how to evaluate search results and information sources,
- understand the principles of scientific publishing,
- can use a reference management tool.

Contents:

Scientific information retrieval and the search terms, the most important databases and publication channels of the discipline, tools for evaluating the quality of scientific information and RefWorks reference management tool.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Training sessions 8h, group work 7h, self-study 12 h

Target group:

The course is compulsory for the international students of Master's Degree Programme in Environmental Engineering (BEE) and for the Master's Degree Programme in Industrial Engineering and Management (Product Management)), and optional for other degree students working on their diploma/master's thesis.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material: "Finding scientific information" http://libguides.oulu.fi/findinginformation

Assessment methods and criteria:

Passing the course requires active participation in the training sessions and successful completion of the course assignments.

Grading:

Pass/fail

Person responsible:

Ursula Heinikoski

Working life cooperation:

-

Other information:

-

900017Y: Survival Finnish, 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900017Y	Survival Finnish Course (OPEN UNI)	2.0 op

Proficiency level:

A1.1

Status:

The course is intended for the international students in every faculty of Oulu University.

Required proficiency level:

No previous Finnish studies.

ECTS Credits:

2 ECTS credits

Language of instruction:

Finnish and English

Timing:

-

Learning outcomes:

By the end of the course the student can understand and use some very common everyday expressions and phrases, and s/he can locate informational content in simple texts and messages. The student also knows the basic characteristics of Finnish language and Finnish communication styles.

Contents:

This is an introductory course which aims to help students to cope with the most common everyday situations in Finnish. During the course, students learn some useful everyday phrases, some general features of the vocabulary and grammar, and the main principles of pronunciation.

The topics and communicative situations covered in the course are: general information about the Finnish language, some politeness phrases (how to greet people, thank and apologize), introducing oneself, giving and asking for basic personal information, numbers, some time expressions (how to tell and ask the time, days of the week, time of day), food, drink and asking about prices.

The structures studied are: personal pronouns and their possessive forms, forming affirmative, negative and interrogative sentences, the conjugation of some verbs, the basics of the partitive singular and some local cases for answering the 'where'-question.

Mode of delivery:

Contact teaching, on-line learning and independent work. There will be organized also one on-line group in each semester.

Learning activities and teaching methods:

Lessons 2 times a week (26 h, including the final exam) and guided self study (24 h)

Target group:

International degree and post-graduate degree students and exchange students of the University

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Will be provided during the course.

Assessment methods and criteria:

Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grading scale is on a pass/fail basis.

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

Sign-up in WebOodi.

Recommended studies

555214A: Working in the university community, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish / English

Timing:

Periods 1-4

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the university community (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- analyse and find development targets related to the tasks

Contents:

Communication, collaboration, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills.

Mode of delivery:

The tuition will not be organised.

Learning activities and teaching methods:

Students complete tasks with their own activities to support the university community and their own professional growth.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management or similar knowledge.

Recommended optional programme components:

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Recommended or required reading:

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Assessment methods and criteria:

The course can include several tasks as follows: Student Union 2 years 2 ECTS, University Board 1 year 2 ECTS, University Collegial Body 2 years 2 ECTS, Education Council 1 year 2 ECTS, Education Management Team 1 year 2 years, Faculty Management Team 1 year 2 ECTS, Faculty Board 2 years 2 ECTS, Faculty Education Council 2 years 2op, Student Union Board 1 year 1-3 ECTS, National Student Organisation 1 year 1-5 ECTS, Other major education policy and / or teaching development tasks 1-3 ECTS credits, Student Tutor or Teaching Assistant 2 ECTS cr.
The student writes a report on conducting the tasks, which includes the following: 1) In which positions did the student work, how long and how actively he/she participated? (0.5 pages). 2) What does the student think he/she has learned from the duties and how can the experience be utilized in the future? In particular, these skills should be considered: communication, co-operation, creativity, problem-solving, project management, learning, technical skills, international skills, commercial and financial skills and the development of self-knowledge (1 page). 3) How would the student think that the activity could be developed by the methods of industrial engineering and management? (1.5 pages). A report and a certificate on the tasks will be returned to the teacher tutor, who determines the number of credits to be awarded. The length of the report is 3 pages.

Grading:

pass / fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

-

555215A: Working life project, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish / English

Timing:

Periods 1-4

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the working life (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- analyse and find development targets related to the tasks

Contents:

Communication, collaboration, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills.

Mode of delivery:

The tuition will not be organised.

Learning activities and teaching methods:

Students complete tasks with their own activities to support their own professional growth.

Target group:

Industrial Engineering and Management students

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management or similar knowledge.

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Participation in a company project, competition or similar (e.g. Accenture innovation challenge, ESTIEM Times). The student writes a report on conducting the tasks, which includes the following: 1) In which positions did the student work, how long and how actively he/she participated? (0.5 pages). 2) What does the student think he/she has learned from the duties and how can the experience be utilized in the future? In particular, these skills should be considered: communication, co-operation, creativity, problem-solving, project management, learning, technical skills, international skills, commercial and financial skills and the

development of self-knowledge (1 page). 3) How would the student think that the activity could be developed by the methods of industrial engineering and management? (1.5 pages). A report and a certificate on the tasks will be returned to the teacher tutor, who determines the number of credits to be awarded. The length of the report is 3 pages.

Grading:

pass / fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

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555310S: Demola Project, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

555300S: Master's Thesis, 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

470099S	Master's Thesis in Industrial Engineering and Management	30.0 op

ECTS Credits:
30 ECTS credits.
Language of instruction:
Finnish / English.
Timing:
Periods 1-4.
Learning outcomes:
Upon completion of the course, the student will be able to:

- solve challenging problems in organisations independently
- create a research plan, and define a research problem and research questions
- manage his own work according to the research plan
- utilise different information sources and critically evaluate the information obtained
- create a written report according to the instructions

Contents:
The research topic is selected in co-operation with the instructor.
Mode of delivery:
The tuition will be implemented as self-study and face-to-face teaching.
Learning activities and teaching methods:
Self-study 804 h. The student defines the research topic in co-operation with the instructor. The thesis is typically an empirical or a theoretical study.

Target group:
Industrial Engineering and Management students.
Prerequisites and co-requisites:
B.Sc. in Industrial Engineering and Management or equivalent. Courses that support the topic of the thesis.
Recommended optional programme components:
The students will complete 555301S Research seminar in industrial engineering and management simultaneously.
Recommended or required reading:
The instructions and forms related to master's thesis are available at Oulu University's Master's thesis webpage.
Assessment methods and criteria:
This course includes writing a Master's Thesis.The work is assessed by using th thesis assessment form.
Grading:
The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Adjunct professor Jukka Majava
Working life cooperation:
The thesis is typically done for a private or public sector organisation.
Other information:
The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage "Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" -menu.
Substitutes course 477991S Master's Thesis.

555302S: Maturity Test / Master of Science in Industrial Engineering and Management, 0 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555312S	Maturity Test / Industrial Engineering and Management	0.0 op

Assessment methods and criteria:
Maturity test related to the thesis topic is taken as an electronic exam in the Exam-system. Examination time is settled with the thesis supervisor. The assessor of the maturity test (supervisor) creates the maturity into the Exam system as a personal exam.
Grading:
Pass - Fail
Other information:
The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage "Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" -menu.

555307M: Common Studies of the Majors in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440230: Major Studies, Product Management, 40 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Module of the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

555313S: Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Language of instruction:

English

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of general management
- know the historical developments in the management thought
- have an understanding about the qualifications of a manager in a modern organisation
- understand the principles of the managerial decision making
- distinguish between the terms management and leadership
- have an understanding about good managerial practices

Contents:

Managers and Managing, The Evolution of Management Thought, Values, Attitudes, Emotions, and Culture: The Manager as a Person, Ethics and Social Responsibility, Managing Diverse Employees in a Multicultural Environment, Decision Making, The Manager as a Planner and Strategist, Managing Organisational Structure and Culture, Organisational Control and Change, Motivation and Performance, Leadership, Effective Groups and Teams, Promoting Effective Communication, Managing Conflict, Politics, and Negotiation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 10 h, case examples 10 h, self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Jones G. R. & George J.M (2014) Contemporary Management. McGraw-Hill. Case descriptions.

Assessment methods and criteria:

The assessment is based on the exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ D. Sc. Hannele Lampela

Working life cooperation:

No.

Other information:

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555314S: Management Information Systems, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Hannele Lampela
Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3 - 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the key concepts of management information systems
- understand the significance of information and information management in modern business and business process management
- define the information needs of management processes and understands how information systems can meet these needs
- recognise the current trends in management information systems technologies and practices and find out the relevant MIS information sources
- participate in enterprise information system designing, purchasing, and development tasks as a role of industrial engineer/process developer
- strengthen the self-directing, reflective learning skills

Contents:

Key concepts: management information systems (MIS), managerial information, different types of MIS applications, information systems in decision making and leadership, the effects of information technology in business processes and their development. Current trends in management information systems technologies and practices, business driven IT infrastructure and management, special characteristics of business development projects that contain ICT implementation.

Mode of delivery:

The tuition will be implemented as face-to-face teaching. If active participation for the course is not possible, independent learning method is offered including a case study in a student’s own work organisation (independent learning method is available only for IEM students).

Learning activities and teaching methods:

Lectures 14 h, self-study and group work 117 h. The implementation methods of the self-study and group work vary.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent, 555313S Management.

Recommended optional programme components:

Basic understanding of some business process areas helps learning (e.g. production management, supply chain management, sales and marketing management).

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment based on conducting the learning tasks (individual and group work). Since the implementation of self-study and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

D. Sc. Hannele Lampela

Working life cooperation:

The course includes the guest lectures of industry to offer various and topical views to MIS in practice.

Other information:

Substitutes the course 555344S Management Information Systems.

555301S: Research Seminar, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannele Lampela

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Teaching during periods 1 - 4. Course can be completed in parts. Course registration is open during 15.8. - 15.5.

Learning outcomes:

Upon completion of the course, the student will be able to:

- know scientific process and different research methods
- select an appropriate method for his/her master’s thesis work
- evaluate validity of research work and provide constructive criticism
- report research findings in the form of academic research report and participate in academic discussion

Contents:

Research approach, qualitative and quantitative research methods, structure of research report, evaluating validity of research, constructive criticism and participation in scientific discussion.

Mode of delivery:

Multiform learning, with face-to face lectures, seminar work and independent learning. The course will use Moodle platform.

Learning activities and teaching methods:

Lectures and seminar work 20 h, independent learning 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

Research report is based on research work student is doing for his/her master's thesis work

Recommended or required reading:

Lecture material. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course can be completed in seminar sessions by actively participating in discussion, presenting own research work, giving feedback on other student's research work, acting as an opponent to two ready thesis works, and writing a scientific article on own research topic. The seminar sessions will include three lectures on research approach and qualitative and quantitative research methods, and writing a scientific article. Participation in these three lectures is required to pass the course and they are lectured two times a year.

Grading:

The course utilizes verbal grading "Pass/Fail".

Person responsible:

D. Sc. Hannele Lampela

Working life cooperation:

No.

Other information:

The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage "Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" - menu.

555304S: Advanced Internship, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555311S	Advanced Internship	3.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

English

Timing:

Periods 1 - 4 and summer

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the working life (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- reflect the tasks to IEM studies completed
- analyse and find development targets in IEM courses related to the tasks

Contents:

Communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills

Mode of delivery:

The tuition will not be organised. The student is responsible for finding the internship position that can be a summer job, some other salaried position or work experience, or a position without salary in an organization.

Learning activities and teaching methods:

Students complete tasks with their own activities to support their own professional growth in working-life. Internship duration should be at least 2 months.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

Bachelor's degree or equivalent knowledge.

Recommended optional programme components:

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Recommended or required reading:

-

Assessment methods and criteria:

The internship must provide at least 2 months working experience related to your studies. Internship period cannot be the same as in course 555204A Harjoittelu. The length of the written report is 2-3 pages and it must address the following questions:

- Where (organization name, location) did you perform the internship?
- How did you find this position (PESTI-days or some other way)?
- How was the application procedure? Was there an interview etc?
- Have you worked in this organization earlier?
- What tasks were you doing during the internship period?
- Were these tasks related to your major, supplementary, or engineering studies?
- Which theories or skills in IEM courses were useful in your job?
- What type of topics should be added to the IEM courses based on your internship experience?

The report and a certificate provided by the organization where internship took place must be sent via email to your teacher tutor (Product Management, Tuotantotalouden tutkinto- ja maisteriohjelmat).

Grading:

Pass/ Fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Yes. The student gains working experience in an organization.

Other information:

Information about internship placements and financial support can be found in Oulu University's webpage about traineeship. On traineeship issues you can contact the traineeship contact person for Faculty of Technology

Substitutes the course 555311S Advanced Internship.

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company
- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Janne Härkönen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Janne Härkönen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

A440259: Complementary Study Module of the Major/ Organization and Knowledge management, Advanced Module, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Obligatory studies of Organisation and knowledge management

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: English

Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: English

Leikkaavuudet:

555360S Administration, Organization and Education in Working Life 5.0 op

Elective advanced studies

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: Finnish
Leikkaavuudet:

555360S Administration, Organization and Education in Working Life 5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education's Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T. (Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases. Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op

555326S Research Project in Production Management 5.0 op
555348S Research Project in Technology Management 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company's development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Project Management

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Kirsi Aaltonen
Opintokohteen kielet: English
Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:
5 ECTS credits.

Language of instruction:
English.

Timing:

Periods 1-2.

Learning outcomes:
Upon completion of the course, the student will be able to:
- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:
different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:
The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:
Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:
Industrial Engineering and Management students.

Prerequisites and co-requisites:
555285A Basic course in project management.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Kujala

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools
- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

-

Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results
- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

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Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company
- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Janne Härkönen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

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555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

A440260: Complementary Study Module of the Major/ Project Management, Advanced Module, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Obligatory studies of Project Management

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:

different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555285A Basic course in project management.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

Elective advanced studies

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: Finnish
Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education’s Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T. (Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases. Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op
555326S	Research Project in Production Management	5.0 op
555348S	Research Project in Technology Management	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company's development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

555309M: Supplementary Studies of the Majors in other Universities /Institutes, 0 - 60 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Organisation and knowledge management

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: English
Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: English
Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools
- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

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Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results
- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

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Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company
- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company’s HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company’s business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Janne Härkönen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

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555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

A440261: Complementary Study Module of the Major/ Process and Quality Management, Advanced Module, 15 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Obligatory studies of Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools
- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

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Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results
- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

-

Elective advanced studies

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education's Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T. (Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases. Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op
555326S	Research Project in Production Management	5.0 op
555348S	Research Project in Technology Management	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company’s development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

Project Management

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:

different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555285A Basic course in project management.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: English

Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: English
Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

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555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems

- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company
- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

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Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail
Opettajat: Janne Härkönen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

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Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

A440270: Complementary Module, Other Industrial Engineering and Management Studies, 20 - 30 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Supplementary Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Elective studies (max 10 cr)

555226A: Operations and supply chain management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555222A	Demonstration in Industrial Engineering and Management	2.0 op
555223A	Introduction to Production Control	3.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- describe different production types
- apply different forecasting methods, plan needed production capacity, and apply location and transportation decisions related methods
- master common inventory management methods and aggregated and short-term scheduling
- create a sales and operations plan for a company

Contents:

Production types, forecasting methods, capacity planning and queuing models, location and transportation decisions, inventory management systems, aggregate scheduling, MRP & ERP, short-term scheduling, linear programming.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 16 hours / independent studying 64 hours.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management or similar knowledge.

Recommended optional programme components:

Industrial Engineering and Management students will complete 902143Y Company presentations course simultaneously.

Recommended or required reading:

Lecture and exercise materials. Krajewski, L.J. et al. (2012) Operations management: processes and supply chains, 10th ed. Pearson. In addition, recommended material includes chapter 13 in Heizer, J. & Render, B. (2014) Operations management: sustainability and supply chain management, 11th ed. Pearson.

Assessment methods and criteria:

This course utilises continuous assessment. During the course, there are mandatory weekly assignments. At least half of the assignments must be passed. 40 % of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Post-doctoral researcher Farzad Pargar.

Working life cooperation:

The group work will be done for a real company by using public information sources.

Other information:

Substitutes course 555222A Demonstration in Industrial Engineering and Management 2 ECTS cr and 555223A Introduction to Production Control 3 ECTS cr.
Previous course name was 'Operations and Production'.

555242A: Product development, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

ay555242A	Product development (OPEN UNI)	5.0 op
555240A	Basic Course in Product Development	3.0 op

Ei opintojaksokuvauksia.

555264P: Managing well-being and quality of working life, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555264P	Managing well-being and quality of working life (OPEN UNI)	5.0 op
555261A	Basic Course in Occupational Psychology	3.0 op
555262A	Usability and Safety in Product Development	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- set targets and choose appropriate methods of developing well-being at work both at personal and organizational levels
- develop well-being at work in the contexts of labor legislation, good practices, productivity, occupational safety expertise, management and human resources
- know the key sources of information, typical goal-setting and management practices and the methods for assessing the performance at individual and organizational levels
- assess the economic impacts of well-being at work, especially in cases of work ability, occupational health, job satisfaction, occupational safety, productivity and the overall quality of working life
- know essential national and international regulation and strategic goal setting practices, good practices of the case companies, current trends, and methods in research.

Contents:

The course gives the student a vision of building sustainable, productive and satisfactory career. The contents cover the whole area of basic quality issues of working life analysing them in the following framework "Well-being at work means safe, healthy, and productive work in a well-led organisation by competent workers and work communities who see their job as meaningful and rewarding, and see work as a factor that supports their life management".

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 10 h / self-study 70 h / group work & exercises 42 h.

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial Engineering and Management that also includes 555225P Basics of industrial engineering and management**,** 555285P Project Management, 555242A Product development, and 555286A Process and quality management.

Recommended or required reading:

Applicable parts of Arnold, J. et al. (2010), Work Psychology; Understanding Human Behaviour in the Workplace. 5th Edition. Financial Times/Prentice Hall and Aura, O. & Ahonen, G. Strate-gisen hyvinvoinnin johtaminen, Alma Talent. Other literature will be informed during the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), group work (weight 40 %) and examination (weight 40 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

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Other information:

Substitutes courses 555261A Basic Course in Occupational Psychology + 555262A Usability and Safety in Product Development.

555285A: Project management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

555288A	Project Management	5.0 op
ay555285A	Project management (OPEN UNI)	5.0 op
555282A	Project Management	4.0 op
555280P	Basic Course of Project Management	2.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material may also be used.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- describe explain the essential concepts and methods related to project management
- apply project management methods to create a schedule for a project and calculate critical path
- understand essential concepts related to project cost management and able to apply earned value method and three point estimate to manage project costs
- recognises the essential tasks of project risk management

Contents:

Defining project management, project goals and objectives, project phases and project life-cycle management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management, project stakeholder management, project communications management, the role of project manager, new modes of project delivery

Mode of delivery:

The tuition will be implemented as web-based teaching.

Learning activities and teaching methods:

Web-based lectures 16h, self-study 118h

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes555225P Basics of industrial engineering and management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended or required reading:

Lecture material, exercise book, Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY

Assessment methods and criteria:

Assignments, exercise book and exam. The course grading is based on the exam. Well completed assignments and exercise book may raise grading.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry

Other information:

Substitutes courses 555280P Basic Course of Project Management + 555282A Project Management.

555286A: Process and quality management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555286A	Process and quality management (OPEN UNI)	5.0 op
555281A	Basic Course of Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the role of process and quality management in a business organisation

- develop business processes based on the principles of quality management and appropriate tool

Contents:

Foundations of total quality management, planning of quality, performance measurement, process management, people management in relation to quality management, implantation of total quality management.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

20 h lectures, 114 h independent study

Target group:

Industrial Engineering and Management students and other students studying Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

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Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes 555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, and 555264P Managing well-being and quality of working life.

Recommended or required reading:

Oakland, J.S. (2014) Total quality management and operational excellence (4th ed.). Routledge, 529 pp. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must pass the weekly course exercises (50 % of the course grade) and an exam (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555281A Basic Course of Quality Management.

Elective advanced studies

555377S: Risk Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555321S	Risk Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:
• explain the key concepts of enterprise risk management and uncertainty management
• explain the role of risk management in organisations and compare the specific features of risk management in different organisational contexts
• identify and classify risks and conduct systematic risk analyses in organisations
• make informed improvement suggestions related to enterprise risk management in or-ganisations
• to develop enterprise risk management processes in organisations

Contents:

Definitions of risk and uncertainty, risk management standards, risk classification models, sys-tematic risk management process, methods of risk management, psychological aspects of risk management, ERM and organising of risk management, risk management in different contexts, risk governance.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teach-ing).

Learning activities and teaching methods:

Lectures 26h, self-study 42h, group assignment and cases 66h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture. The ma-terials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment meth-ods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant Professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555321S Risk Management.

555376S: Sustainable organisational development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used (the course can be completed in English as a book examination).

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the general models regarding sustainable organisational development
- adapt the most central ones to the work organisations
- choose the most suitable models for different situations and can interpret the results gained from different approaches
- explain the most important quantitative and qualitative variables that are either preconditions or results of the operation of the organisation
- identify development needs and opportunities in companies and other organisations.

Contents:

The development of organisation is examined through e.g. the following concepts: productivity, well-being at work, quality control, quality of working life, safety and security, and responsibility. Various concepts and indicators will be discussed, for example, in relation with change processes (e.g. strategy, owner, partnerships, sizes of operations and personnel), implementation, participation, intervention, action research, and learning organisation.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and web-based teaching).

Learning activities and teaching methods:

Lectures 22 h / self-study 100 h / group work & exercises 12 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555265P Occupational safety and health management, 555264P Managing well-being and quality of working life, 555371S Human resource management.

Recommended optional programme components:

555371S Human resource management, 555370S Strategic management, 555377S Risk Management. Research project in industrial engineering and management related to Organisation and knowledge management topic and Faculty of Education’s Organisational psychology course can be conducted to complement this course.

Recommended or required reading:

Applicable parts of: Hatch, M. J. and Cunliffe A.N. (2013) Organization Theory, Modern, Symbolic, and Postmodern Perspectives. Third Edition, Oxford University Press. Väyrynen, S., Häkkinen, K., Niskanen, T. (Eds.) (2015). Integrated Occupational Safety and Health Management - Solutions and Industrial Cases.

Springer, Production & Process Engineering. 248 p. Other literature will be informed at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), seminar work (weight 30 %) and examination (weight 50 %).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Previous course name was Organisational Development.
Substitutes course 555360S Administration, Organization and Education in Working Life.

555378S: Seminar in industrial engineering and management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555385S	Advanced Course in Quality Management	5.0 op
555386S	Advanced Course in Project Management	5.0 op
555347S	Seminar in Technology Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-4.

Learning outcomes:

Learning outcomes depend on the content of each seminar. The seminar topics are related to production management, product management, organization and knowledge management, project management, and process and quality management.

Contents:

Will be defined at the beginning of the course.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555347S Seminar in Product Management, 555385S Research Project in Quality Management and 555386S Research Project in Project Management.

555379S: Research Project in Industrial Engineering and Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555367S	Exercises in Work Science	6.0 op
555387S	Project Work in Quality Management	5.0 op
555388S	Project Work in Project Management	5.0 op
555326S	Research Project in Production Management	5.0 op
555348S	Research Project in Technology Management	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English

Timing:

Periods 1-4 or as summer studies independently

Learning outcomes:

Learning outcomes depend on the project work contents.

Contents:

Project work topics and types vary. The topics are typically related to actual problems in the industry.

Mode of delivery:

Will be defined at the beginning of the course.

Learning activities and teaching methods:

The methods are agreed with the project work instructor. The work can be done individually or in a group.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

The assessment is based on the project work report.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

The objective of the course is to apply the methods of industrial engineering and management in a company's development activities. The course provides the student with an opportunity to combine and apply his/her existing knowledge in a study project. The student familiarises himself/herself with research work and reporting of the results.
Substitutes courses 555326S Research Project in Production Management, 555348S Research Project in Product Management, 555367S Exercises in Work Science 555387S Research Project in Quality Management and 555388S Research Project in Project Management.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Project Management

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: English

Leikkaavuudet:

555381S	Project Leadership	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:

different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555285A Basic course in project management.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:

This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry.

Other information:

Substitutes course 555381S Project Leadership.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm
- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:

Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 24h / self-study56h / group exercise 54h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

Group work will be done for a project-based firm or public sector organisation.

Other information:

Previous course name was 'Management of a Project-based Firm'.

Organization and knowledge management

555370S: Strategic Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: English
Leikkaavuudet:

555320S	Strategic Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3.

Learning outcomes:

Upon completion of the course, the student will be able to:

- utilise strategic thinking, planning, and management
- analyse and plan complex global business operations
- participate in strategic planning and strategy implementation in organisations
- apply strategy analysis frameworks and analyse the implementation of the chosen strategy

Contents:

Strategic thinking, strategic planning, strategic management, strategy analysis frameworks, strategy implementation with a simulation, analysis of the strategy implementation.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 6 h / exercises 6 h / group work 122 h. Alternatively independent learning method: book examination 134 h.

Target group:

Industrial Engineering and Management.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Industrial Engineering and Management. Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.

Assessment methods and criteria:

This course utilises continuous assessment. The group work includes the creation of strategic plan (10 % of the grade), business simulation (30 % of the grade), and the analysis of the strategy (60 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes course 555320S Strategic Management.

555371S: Human Resource Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Reiman
Opintokohteen kielet: English
Leikkaavuudet:

555360S	Administration, Organization and Education in Working Life	5.0 op

Process and Quality Management

555390S: Process Analytics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

555380S	Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- analyse and improve the processes of an organisation with the help of statistical tools
- disseminate the applicability of various statistical tools and methods in different kinds of organisational environments

Contents:

Processes in an organization from a statistical viewpoint, tools and methods of statistical process control, process improvement using numeric data, stages, challenges and implementation of data analysis, the role of statistical methods in various management philosophies.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

28 h lectures, 106 h independent study on course exercises.

Target group:

Industrial Engineering and Management students and other students studying taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

555286A Process and Quality Management

Recommended optional programme components:

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Recommended or required reading:

Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the course exercises. The course grade is determined by the completeness and independent thought demonstrated in the set of exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555380S Quality Management.

555389S: Systematic Process Improvement, 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

ECTS Credits:

10 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1 - 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- manage the improvement and problem solving in a process using quality management tools
- explain the steps of the DMAIC problem solving model and apply the correct tools for each step
- apply quality tools into real life process data with the help of MINITAB software and to analyse the results

- increase his/her understanding of the process type studied in the course exercise

Contents:

Problem solving using DMAIC, the Six Sigma body of knowledge quality tools, use of MINITAB software, process improvement in practice.

Mode of delivery:

The tuition will be implemented as blended teaching.

Learning activities and teaching methods:

Lectures and related exercises, site visit, a large group exercise related to a process operating in practice.

Target group:

Industrial Engineering and Management students, other students taking Industrial Engineering and Management as minor, postgraduate students.

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent. Basic knowledge of statistical process control.

Recommended optional programme components:

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Recommended or required reading:

Kubiak, TM & Benbow DW (2009) The Certified Six Sigma Black Belt Handbook, Second Edition. ASQ Quality Press, Milwaukee. 620 s. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the group work as an active team member (50 % of the course grade), take part in the course lectures and return the related exercises (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

a group exercise related to a process operating in practice.

Other information:

-

Product Management

555350S: Research and Technology Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555340S	Technology Management	4.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the differences between product development and technology management in a company
- piece together the development needs and cycles of technologies in an organisation
- combine technology development and technology management with strategic planning of a company

Contents:

Defining technology and its role within an enterprise and within society, the meaning of innovation in technological competition, the lifecycles of technology including development, acquirement, and transition

Mode of delivery:

The tuition will be implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures 21 h / exercises, group work and self-study 114 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product Development.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and articles.

Assessment methods and criteria:

Exam and group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

Visitor lecturers from the industry

Other information:

Previous course name was 'Technology Management'.
Substitutes course 555340S Technology Management.

555351S: Advanced Course in Product Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555345S	Advanced Course in Product Development	6.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the objectives of requirements engineering (RE), design for excellence (DfX) product design concept and delivery capability creation (DCC) in order to develop and ramp up sustainable products with minimum product specific investments
- understand requirements engineering process and its key activities, DfX product design concept as product design guidelines, targets and key performance indicators (KPIs)
- understand DCC process as a sub-process of new product development (NPD) process including key roles, tasks and milestone criteria
- analyse and further develop RM, DfX and DCC as a part of product development processes

Contents:

The concepts of requirements management, requirements engineering process, requirement prioritisation and valuation, Design for Excellence (DfX), delivery capability creation (DCC), different stakeholders and their requirements for product development

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 16 h / group work and self-study 119 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Research and Technology management (Technology Management).

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Substitutes course 555345S Advanced Course in Product Development.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Härkönen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles as concept owners, education and support roles, data owners, data users including product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PPM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Lectures 20 h, practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development, 555346S Product portfolio management.

Recommended optional programme components:

555351S Advanced course in product development, 555350S Research and technology management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

555346S: Product portfolio management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Janne Härkönen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Periods 3-4.

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management and product portfolio management. Student knows the basic steps of the product portfolio management development and understands the ways to analyse and manage products and product portfolios. A student learns to see product and product portfolio management as strategic targets, performance indicators, governance models, process and product information management over horizontal and technical portfolios over product life cycle phases and product structure levels. The student can apply the learned things and methods in different industries in order to develop systematic product and product portfolio management processes.

Contents:

Basic issues in product and product portfolio management performance management, governance models, horizontal and vertical portfolios, processes, tools and product information.

Mode of delivery:

The tuition will be implemented as face-to-face learning and practical assignments.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial Engineering and Management and Master's Programme in Product Management students.

Prerequisites and co-requisites:

555242A Product development, 555350S Technology management.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Janne Härkönen

Working life cooperation:

No.

Other information:

Previous course name was 'Product Management'

Production Management

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

555323S	Sourcing Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures , assignment guidance) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess/ Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S	Advanced Supply Chain Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- define supply chain management concepts, describe supply chain structures, and explain the importance of effective supply chain management
- analyse supply chain operations and propose development areas based on the analysis
- act in an expert role in supply chain development

Contents:

Supply chain management concepts, supply chain structures, effectiveness of supply chain, supply chain analysis and development.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 8 h / exercises 4 h / group work 68 h / self-study 54 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

-

555332S: Operations Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555342S	Operations Research	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the basic concepts of operations research and its applications in operations and production activities and decision-making in companies
- apply quantitative methods typical to the field of operations research in practical problem solving

Contents:

What is operations research, linear and dynamic programming, network and transportation algorithms, decision analysis, inventory models, queueing systems, simulation modeling.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (lectures, classroom exercises and group work).

Learning activities and teaching methods:

Lectures 20 h / classroom exercises 20 h / independent study and group work 96 h.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

Bachelor in industrial engineering and management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Taha, H. A. (2011) Operations Research: An Introduction, 9/E. Prentice Hall. Foreman, J. (2014) Data smart: using data science to transform information into insight. Wiley & Sons: Indianapolis. Other material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must complete the required coursework consisting of the exercises handed out during the classroom study (50%) and a compilation of analytics exercises that can be done in groups (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila

Working life cooperation:

No.

Other information:

Substitutes course 555342S Operations Research.

555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555322S	Production Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Lectures 20 h, assignment guidance 20 h, group work 94 h.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Pekka Kess

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440253: Supplementary Module, Electronics and Communications Engineering, 20 - 30 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Supplementary Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electronics

521432A: Electronics Design I, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Nissinen, Kari Määttä
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Spring, period 4.

Learning outcomes:

1. should be able to recount the principles covering the design of multistage amplifiers

2. should be able to analyze and set the frequency response of a transistor amplifier

3. should be able to make use of feedback to improve the properties of an amplifier in the desired manner

4. should be able to analyze the stability of a given degree of feedback amplification and to dimension an amplifier correctly to ensure stability

5. should be able to describe the principles governing the design of power amplifiers

6. should be able to make widespread use of operational amplifiers for realizing electronic circuits and to take account of the limitations imposed by the non-idealities inherent in operational amplifiers

7. should be able to design low-frequency oscillators, to explain the operating principles of radio frequency oscillators and tuned amplifiers

Contents:

Frequency response of a transistor amplifier, differential amplifier, feedback, power amplifiers, oscillators and tuned amplifiers, non-idealities of an operational amplifier, applications of operational amplifiers.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h and exercises 20 h.

Target group:

Students of Electrical engineering. Other students of the University of Oulu may also participate.

Prerequisites and co-requisites:

Principles of electronic design

Recommended optional programme components:

This course is required when participating in Laboratory Exercises on Analogue Electronics.

Recommended or required reading:

Lecture notes, book: Behzad Razavi, “Microelectronics”, 2nd Edition, ISBN 9781-118-16506-5
John Wiley & Sons 2015

Assessment methods and criteria:

Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Juha Kostamovaara

Working life cooperation:

-

Other information:

-

521070A: Introduction to Microfabrication Techniques, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teirikangas, Merja Elina

Opintokohteen kielet: Finnish

Leikkaavuudet:

521218A	Introduction to Microelectronics and Micromechanics	4.0 op
521218A-02	Introduction to Microelectronics and Micromechanics, demonstration	0.0 op
521218A-03	Introduction to Microelectronics and Micromechanics, exercise	0.0 op
521218A-01	Introduction to microelectronics and micromechanics, exam	0.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

2nd period

Learning outcomes:

1. Can present the process of source materials used to manufacture micro- and nanoelectronics /mechanics and analyse the required material properties depending of the application

2. Can explain the fabrication methods and discuss the characteristic features of each fabrication method, inculding their utilisation and restrictions.

3. Is capable of designing a fabrication process for a simple microelectronics application and is able to indetify the process steps also in complex application.

Contents:

The content of the course covers fabrication methods of micro-, nano- and optoelectronics as well as MEMS systems. 1. Fabrication methods for silicon based electronics and MEMS systems 2. Additive manufacturing methods 3. Nanomaterials and fabrication.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

Lectures (20 hours) and exercises (10 +10).

Target group:

Electrical engineering bachelor degree students.

Prerequisites and co-requisites:

Course content of 521104P Introduction to Materials Physics and 521071A Principles of Semiconductor Devices.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes, Franssila Sami: Introduction to Microfabrication

Assessment methods and criteria:

Final written exam and passes laboratory exercises.

Grading:

Numerical grading 1-5.

Person responsible:

Merja Teirikangas

Working life cooperation:

No

521404A: Digital Techniques 2, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Lahti

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

In Finnish. Exams can be arranged in English on demand.

Timing:

Autumn, period 2

Learning outcomes:

1. knows the common architectures of synchronous digital logic circuits, and the building blocks they consist of, and can design digital circuits that realize complex data and signal processing functions.
2. knows most common combinational and sequential logic based buildning blocks, and can use them to design and realize complex digital circuits.
3. knows digital logic design methods, such as use of hardware description languages, functional verification using simulation, realization of logic with a logic synthesis program, and functional and timing verification of gate-level models.

Contents:

1. Logical and physical properties of digital logic components. 2. Representation of digital designs. 3. Combination logic design. 4. Sequential logic design. 5. Digital artithmetics. 6. Semiconductor memories. 7. Register transfer level architecture design. 8. Register transfer level modeling and synthesis. 9. Timing design. 10. Digital interface design. 11. Design verification

Mode of delivery:

Classroom

Learning activities and teaching methods:

Lectures 24h/ exercises 30h (group work)/independent work 84h.

Target group:

Primarily electrical and computer science and engineering students. Also other student of University of Oulu can take the course.

Prerequisites and co-requisites:

Digital techniques 1

Recommended optional programme components:

No

Recommended or required reading:

Lecture textbook (in finnish) and literature announced during course.

Assessment methods and criteria:

Final exam and a design excercise, or weekly assignments consisting of theoretical and design exercises. Read more about assessment criteria at the University of Oulu webpage.

Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5, The grade is the average of the exam and the design exercise, or the grade of the weekly assignments.

Person responsible:

Jukka Lahti

Working life cooperation:

No

Other information:

-

521307A: Laboratory Exercises on Analogue Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Määttä

Opintokohteen kielet: Finnish

Leikkaavuudet:

521316A	Introduction to Broadband Transmission Techniques	4.0 op
521433A	Laboratory Exercises on Analogue Electronics	3.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn, periods 1-2

Learning outcomes:

1. is able to design basic electronic structural blocks and verify their functionality in a CAD simulation environment.

2. is able independently to realize and test a small-scale design object employing analogue circuit techniques.

Design exercises to deepen the understanding of the material presented in Principles of Electronics Design and Analogue Electronics I.

Contents:

Passive RC-circuits, diodes and their applications, bipolar transistor amplifiers, operational amplifiers and their applications, MOS-transistor, tuned circuit and amplifier, oscillator.

Mode of delivery:

Face-to-face teaching, partially independent work

Learning activities and teaching methods:

Independent design and simulating excercise 26 h and guided laboratory work 15 h. Group size is 1 - 2 students.

Target group:

Primarily in electrical engineering students. Other University of Oulu students can complete the course.

Prerequisites and co-requisites:

Student must participate to courses Principles of Electronics Design and Electronics Design I, or he/she must have passed these courses earlier.

Recommended optional programme components:

No

Recommended or required reading:

Lecture notes of Principles of Electronic design and Electronics design 1.

Assessment methods and criteria:

Teacher accepts student's design work and measurement results in laboratory.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes verbal grading scale pass or fail

Person responsible:

Kari Määttä

Working life cooperation:

No

Other information:

-

521075S: Microelectronics Packaging Technologies, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Sami Myllymäki

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

3rd period

Learning outcomes:

1. Upon completing the course student can explain how electronics packaging technology has since invention of transistors to current date, and can estimate how this development is going to continue in future.

2. The student can describe can explain what is meant by microjoining techniques and what are the pros and cons of these.

3. The student can tell what different kind of materials, and why, are used in IC packaging technology.

4. The student can explain what is meant with system level packaging and how the strong miniaturization on IC requires new system level packaging techniques to be developed.

5. He can explain why active and passive components are being, more and more, embedded to be a part of the circuit board.

6. In addition he can explain why and how optoelectronics will be migrate towards circuit board and components on it.

Contents:

Trends of packaging and component technologies. Area array packaging techniques. BGA-components. Micro joining and bonding. Multi-chip-modules: MCM-L, MCM-D and MCM-C modules. Fine line techniques. System level packaging (SOC, SOP). Multilayer substrates and integration of passive components. 3-D packaging. Optoelectronics modules. MEMS components. Electronics applications to nanotechnology.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lecturing 24 h, practical work 12 h.

Target group:

Primarily major students of electrical engineering.

Prerequisites and co-requisites:

Recommended Introduction to Microfabrication Techniques.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Rao R. Tummala(edit): Fundamentals of microsystems packaging, New York, McGraw-Hill, 2001. R.R. Tummala and M. Swaminathan, Introduction to System-on-Package (SOP), McGraw-Hill, 2008.

Assessment methods and criteria:

The course is completed with the final exam and finished course work.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Sami Myllymäki

Working life cooperation:

No

Other information:

-

521089S: Printed Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Fabritius

Opintokohteen kielet: Finnish

Leikkaavuudet:

521217S	Printed Electronics	4.0 op
521095S	Advanced Course of Printed Electronics	3.0 op

ECTS Credits:

5

Language of instruction:

Finnish. English if more than two international students in the course.

Timing:

Period 3.

Learning outcomes:

1. Knows the most typical materials and printing methods suitable for their processing
2. Can explain the principles of materials and printing methods
3. Can utilize the material and manufacturing process knowledge to design fabrication processes for electrical components

4. Can analyse how the selected materials and printing methods influence on the performance of electrical components

Contents:

Materials (conductive and semi-conductive polymers, photoactive polymers, dielectrics, particle based inks) and processing methods (screen printing, gravure printing, flexo printing, inkjet) utilized in printed electronics, surface wetting and film formation, printed electrical components (passive components, solar cells, light emitting diodes, transistors) and their fabrication. Possibilities and challenges of printing based processing methods and how to take them into account in the printed electronics fabrication.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Combined lectures and exercises 30 h and self-study 100 h

Target group:

Primarily for the students of electrical engineering

Prerequisites and co-requisites:

None.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

D.R. Gamota, P. Brazis, K. Kalyanasundaram and J. Zhang, "Printed organic and molecular electronics", handout

Assessment methods and criteria:

Course is completed by final examination.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Tapio Fabritius

Working life cooperation:

Not included.

521098S: Testing Techniques of Electronics and Printed Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Fabritius

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish. English, if there are more than 2 foreign students.

Timing:

Period 4.

Learning outcomes:

1. After completing the course the student is able to analyze different kinds of testing strategies, and is able to enhance the testability of electronics through the use of design for testability.

2. The student can also compare different testing techniques of analogue and digital electronics, which have been implemented using either embedded testing methods or external automatic testing equipment.
3. Additionally, the student is able to analyze tests made using an automatic test instrument, compare different test interfaces and data busses, and recognizes principles of design of a high-quality printed test circuit board.
4. The Student understands the specific features of printed electronics having an influence on electronics testing and reliability.

Contents:

Overview of different testing methods, constructions of testers, test fixtures, test signal generation and measurement, mixed-signal test buses, DC- and parametric measurements, dynamic tests, AD/DA converter tests, DSP-based tests, data analysis, embedded testing, design for testability, Boundary scan, test applications.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 26h/Exercises 14h and self-studying 100 h.

Target group:

Course is compulsory for the Electrical engineering students in the advanced module of Testing techniques and printed electronics.

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course unit: Electronics Design I, Electronic Measurement Techniques.

Recommended optional programme components:

This course compensates 521098S Testing Techniques of Electronics if the student hasn't got credits from it.

Recommended or required reading:

M. Burns, G. W. Roberts: An Introduction to Mixed-Signal IC Test and Measurement, Lecture slides. Additional material will be announced at the beginning of the course.

Assessment methods and criteria:

Exam and passed lab exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grade is based on exam and grade is on numerical scale 1-5.

Person responsible:

Tapio Fabritius

Working life cooperation:

No.

Wireless communication engineering

521303A: Circuit Theory 2, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

Leikkaavuudet:

521306A	Circuit Theory 2	4.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn, period 2

Learning outcomes:

After the course the student can:
1. use Laplace transform for solving time and frequency response of electric circuits;
2. derive continuous-time transfer functions.;
3. solve their poles and zeros and understand the meaning of those;
4. draw the pole-zero map and Bode plots of any given transfer function;
5. construct 2-port parameter models of a given circuit

Contents:

Use of Laplace transform in network analysis. Properties of network functions, poles and zeros, Boden magnitude and phase plots. 2-port parameter models.

Mode of delivery:

Classroom

Learning activities and teaching methods:

30h lectures, 22 h exercises, and simulation excerices.

Target group:

Finnish BSc students

Prerequisites and co-requisites:

Basics of circuit theory, differential equations.

Recommended optional programme components:

Continuation for Circuit theory 1. Needed in most analog electronics courses.

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 12-18.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical 1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

521384A: Basics in Radio Engineering, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Risto Vuohtoniemi, Aarno Pärssinen

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn, 1st period

Learning outcomes:

1. can define what radio engineering is and list its separate areas and applications from FM-radio to 5G systems.

2. understands the meaning of Maxwell's equations and can solve the propagation of radio waves in a homogeneous medium.

3. can solve EM-fields at an interface of two lossless media.

4. knows main properties of most common transmission line types and can solve EM-fields for coaxial lines and rectangular waveguides.

5. can utilize the methods based on the Smith chart for the impedance matching of microwave circuits and antennas.

6. understands the meaning of Y-, Z-, and S-matrix and can use S-parameters for solving characteristics of microwave circuits.

7. can describe the operation of passive transmission line devices, resonators, filters and circuits based on the semiconductor devices.

8. knows the terms to describe antenna characteristics and can define radiation patterns of simple antennas and antenna arrays.

9. knows different propagation phenomena and can evaluate, which phenomena are relevant in different radio systems in different frequency bands.

10. can describe the structure of a typical radio system and can calculate the S/N-ratio link budget for a radio system on a free-space radio link.

Contents:

Introduction to radio waves and radio engineering. Maxwell’s equations. Fundamentals of electromagnetic fields. Transmission lines and waveguides. Impedance matching. Microwave circuit theory. Passive transmission line and waveguide devices. Resonators and filters. Circuits based on semiconductor devices. Antennas. Propagation of radio waves. Radio system. Applications of radio engineering.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 26 h and exercises 16 h including graded exercise problems.

Target group:

3 rd year bachelor’s degree students.

Prerequisites and co-requisites:

Elementary knowledge of the electromagnetic theory.

Recommended optional programme components:

-

Recommended or required reading:

In Finnish: Antti Räisänen & Arto Lehto: Radiotekniikan perusteet. Otatieto, 2011; also older versions of the book can be used as a course book.
Additional reading in Finnish: Jyrki Louhi & Arto Lehto: Radiotekniikan harjoituksia. Otatieto, 1995.
In English: Antti V. Räisänen & Arto Lehto: Radio Engineering for Wireless Communication and Sensor Applications, Artech House, 2003.
Additional literature in english: D.M. Pozar: Microwave Engineering, 4th edition, John Wiley & Sons, Inc., 2012.

Assessment methods and criteria:

The course is passed with a final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Risto Vuohtoniemi, Aarno Pärssinen.

Working life cooperation:

No

Other information:

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521304A: Filters, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

Leikkaavuudet:

521331A	Filters	4.0 op

ECTS Credits:

5

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Spring, period 3

Learning outcomes:

After the course the student can:
1. draw a pole-zero map for a given transfer function;
2. perform impedance and frequency scaling for component values;
3. choose an appropriate prototype filter and filter degree;
4. synthesize passive RLC filters;
5. synthesize active opamp based filters;
6. can compare various filter technologies;
7. understands the basics of scaling the dynamic range of active filters

Contents:

Filter types and prototypes, component scaling. Synthesis of active and passive filters. Sensitivity analysis and scaling of the dynamic range.

Mode of delivery:

Lectures, excercise and design excercise

Learning activities and teaching methods:

30 h lectures, 16 h exercises. A design excercise.

Target group:

Finnish electrical engineering students

Prerequisites and co-requisites:

Basics of circuit theory, Bode plots and analog design.

Recommended optional programme components:

Course Digital filters expands the topic into digital domain.

Recommended or required reading:

van Valkenburg: Analog Filter Design, 1982, chapters1-14, 18 ja 20 ; or year 2001 edition chapters 1-13.

Assessment methods and criteria:

Circuit is examined by a final exam. Also the obligatory design exercise must be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

521395S: Wireless Communications I, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Kokkonen, Jari Iinatti

Opintokohteen kielet: English

Leikkaavuudet:

521395S-01	Wireless Communications I, Exam	0.0 op
521395S-02	Wireless Communications I, Exercise	0.0 op
521323S	Wireless Communications I	5.0 op
521323S-02	Wireless Communications I, Exercise	0.0 op
521320S	Wireless Communications 2	8.0 op
521320S-01	Intermediate exam or final exam, Wireless Communications 1	0.0 op
521320S-02	Exercisework, Wireless Communications 2	0.0 op
521323S-01	Wireless Communications I, Exam	0.0 op

ECTS Credits:

5

Language of instruction:

English

Timing:

Fall, period 1

Learning outcomes:

Student
1. can analyze the performance of multilevel digital modulation methods in AWGN channel
2. can explain the effect of fading channel on the performance of the modulation method and can analyze the performance
3. recognizes and understand suitable diversity methods for fading channel and related combining methods
4. can understand and explain coding methods for wireless channels
5. recognizes different wideband systems
6. understands the cellular system principle

Contents:

Radio channel models, digital modulation and detection methods, carrier and symbol synchronization, performance of digital modulation in AWGN and fading channel, diversity techniques, coding for wireless channel, multicarrier modulation, spread spectrum, cellular systems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercise (total 40 hours) and the compulsory design work with a simulation program (20 h)

Target group:

1st year WCE students and M.Sc. students (i.e., 4th year in ECE degree programme)

Prerequisites and co-requisites:

521330A Telecommunication Engineering

Recommended optional programme components:

-

Recommended or required reading:

Andrea Goldsmith: Wireless Communications, Cambridge University Press, 2005.

Assessment methods and criteria:

The course is passed with minor exams (only during lecture period) or with final exam; and the accepted design work report. In the final grade of the course, the weight for the examination(s) is 0.6 and that for the design work report 0.4.

Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jari Iinatti / Timo Kokkonen

Working life cooperation:

No

Other information:

-

521340S: Communications Networks I, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Ylianttila

Opintokohteen kielet: English

ECTS Credits:

5 ECTS cr

Language of instruction:

English

Timing:

Fall, period 2

Learning outcomes:

1. Students understand how the modern communications networks have evolved and how the architecture has changed through the recent paradigm shift towards software-centric communications.
2. Students are able to describe the basic system architecture elements of mobile networks, and understands the significance of emerging technologies such as Network Function Virtualization (NFV), Software Defined Networking (SDN), and core network functionalities such as Evolved Packet Core (EPC).

3. Students can describe the main principles of mobility management, network management and orchestration, and network security, and can apply and solve related engineering problems.
4. Students know the basic properties of routing algorithms, and can use graph theory to solve network routing problems.
5. Students are able to simulate different types of networks in simulation environments and solve basic network programming problems. Upon completing the required coursework, students understand the basic functionalities in TCP/IP protocol stack.

Contents:

Communications architecture in mobile, wireless local area and personal area networks. Introduction to cloud and edge computing, network function virtualization and software defined networking. Basic principles of mobility management, network security, network management and orchestration. The goal is to present the basics of the modern communications architectures, and their technical implementation.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 30 h and the compulsory design work (15 h). Design work can be done alternatively either as NS-2 simulation or TCP/IP programming exercise. Design work instructions are provided in digital learning environment (Optima / Moodle).

Target group:

1st year M.Sc. and WCE students

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Software Defined Mobile Networks (SDMN): Beyond LTE Network Architecture, M Liyanage, A Gurtov, M Ylianttila – 2015; A comprehensive Guide to 5G Security, M Liyanage, I Ahmad, A Abro, A Gurtov, M Ylianttila – 2018; In addition, selected supportive online reading materials from recent standards and publications are provided in digital learning environment (Optima / Moodle).

Assessment methods and criteria:

The course is passed with a final examination and the accepted design work report. The final grade is based on examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Mika Ylianttila

Working life cooperation:

No

Other information:

-

521349S: Wireless Communications II, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti-Heikki Tölli

Opintokohteen kielet: English

ECTS Credits:

5

Language of instruction:

English

Timing:

Spring, periods 3-4

Learning outcomes:

1. The student is familiarised with the channel capacity as the fundamental performance measure of wireless communication links, and can explain the effect of fading channel on the capacity in a single-user single-antenna scenarios.
2. The student understands the basic principles for multiuser communications in fading channels, apprehends the notion of capacity region for multi-access and broadcast channels, and is familiarised with different practical multiple access, random access and scheduling methods.
3. The student is acquainted with core principles of adaptive transmission, which requires accurate channel estimates at the receiver and a reliable information exchange mechanisms between the receiver and transmitter. Practical variable-rate variable-power MQAM modulation techniques for fading channels are introduced.
4. The student understands the principles of transmitter and receiver design in the presence of channel distortion. The student is familiarised with various (adaptive) equalization solutions to combat intersymbol interference.
5. Finally, the student is acquainted with the capacity optimal multi-antenna transmission and reception scheme, as well as, with basic multiantenna space-time coding schemes in a single-user multiple-input multiple-output (MIMO) communications scenario.

Contents:

Capacity of wireless channels, multiuser communications, adaptive modulation and coding, equalization, point-to-point MIMO communications and space-time coding.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercise (total 40 hours) and the compulsory design work with a simulation program (20 h).

Target group:

1st year WCE students and M.Sc. students (i.e., 4th year in ECE degree programme).

Prerequisites and co-requisites:

In addition to courses “521395S Wireless Communications I”, 521348S “Statistical Signal Processing I”, 031025A “Introduction to optimization” and 031051S “Numerical matrix analysis”, a working knowledge in digital communications, random processes, linear algebra, matrix manipulation and detection theory is required.

Recommended optional programme components:

Prior knowledge of 521390S Information Theory and 521392S Convex Optimisation is very useful but not mandatory. The course 521324S Statistical Signal Processing II is recommended to be taken in parallel.

Recommended or required reading:

D. N. C. Tse and P. Viswanath, Fundamentals of Wireless Communication. Cambridge University Press, 2005, Chapters 3-7.
Andrea Goldsmith: Wireless Communications, Cambridge University Press, 2005, Chapters 4, 9-11. 14.
Supporting material: Cover & Thomas, "Elements of Information Theory", John Wiley & Sons; Boyd & Vandenberghe, "Convex Optimization", Cambridge University Press, 2004.

Assessment methods and criteria:

The course is passed with a final examination and the accepted simulation work report. The final grade is a weighted sum of exam (70%), homework (20%), and work report (10%).

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Antti Tölli

Working life cooperation:

No

Other information:

Course replaces the old course 521317S Wireless Communications II (8cr).

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440265: Complementary Module, Medical and Wellness Technology, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

764327A: Virtual measurement environments, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: Finnish
Leikkaavuudet:

764627S	Virtual measurement environments	5.0 op

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

Finnish (or English)

Timing:

Bachelor studies, autumn term, 2nd period

Learning outcomes:

The student will learn how to construct software environments for measurements and data analysis important in biomedical engineering and physics.

Contents:

The course gives basic skills to use measuring and analyzing programmes applied not only in academic research but also in R&D of the companies, and their programming environments (Matlab, LabView).

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 12 h, project work 65 h, self-study 58 h

Target group:

Bachelor students of Medical and Wellness Technology and Physics. Also for other students of the University of Oulu.

Prerequisites and co-requisites:

Basics / basic skills in programming

Recommended optional programme components:

The course is independent entity and does not require additional studies carried out at the same time. The course can also be completed as a part of advanced studies with the course code 764627S.

Recommended or required reading:

Lecture and exercise notes, other given material

Assessment methods and criteria:

Completion of projects.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5 or fail. In the numerical grading scale zero stands for a fail. Grading is made based on the projects.

Person responsible:

Professor Timo Jämsä

Working life cooperation:

None

521273S: Biosignal Processing I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 50 hours of work

Language of instruction:

English. Examination can be taken in English or Finnish.

Timing:

The course unit is held in the autumn semester, during period 2. It is recommended to complete the course at the end of studies.

Learning outcomes:

After completing the course, student
1. knows special characteristics of the biosignals and typical signal processing methods
2. can solve small-scale problems related to biosignal analysis
3. implement small-scale software for signal processing algorithms

Contents:

Biomedical signals. Digital filtering. Analysis in time-domain and frequency domain. Nonstationarity. Event detection. Signal characterization.

Mode of delivery:

Face-to-face teaching and guided laboratory work. The laboratory work can alternatively be performed on an online system.

Learning activities and teaching methods:

Lectures 10h, Laboratory work 20h, Self-study 20h, written examination.

Target group:

Students interested in biomedical engineering, at their master's level studies.
Students of the University of Oulu.

Prerequisites and co-requisites:

The mathematic studies of the candidate degree program of computer science and engineering, or equivalent. Programming skills, especially basics of the Matlab. Basic knowledge of digital signal processing.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

The course is based on selected chapters of the book "Biomedical Signal Analysis", R.M Rangayyan, 2nd edition (2015). + Lecture slides + Task assignment specific material.

Assessment methods and criteria:

Laboratory work is supervised by assistants who also check that the task assignments are completed properly. All task assignments are compulsory. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Tapio Seppänen

Working life cooperation:

No.

080929S: Health Technology and Multimodal Monitoring, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credit points /135 hours of work.

Language of instruction:

English

Timing:

The course is held in the Spring semester, during period III.

Learning outcomes:

The course provides students with a broad overview of the health technology that is currently in development and becoming for home and/or clinical use.

Students learn the concepts of multimodal monitoring and examples of its usage in clinical applications and in medical research (including human and animal studies).

Contents:

Multimodal monitoring is increasingly being employed in clinical monitoring and in the study of human physiology. It is the simultaneous measurement of multiple physiological parameters to provide better context for their interpretation and correlations, and to enable studies of relationships between different physiological signals. Besides the concepts of multimodal monitoring, this course provides students a broad overview of the health technology that is currently in development and becoming for home or clinical use. Moreover, their usage in medical applications and for different study purposes (human and animal) are dealt.

Mode of delivery:

Web-based teaching + Face-to-face teaching

Learning activities and teaching methods:

Lectures, demonstrations, seminars and self-study

Target group:

Medical and Biomedical students

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Reading material will be provided during the course.

Assessment methods and criteria:

The assessment of the course is based on the learning outcomes of the course, based on the seminar work and exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Teemu Myllylä

Working life cooperation:

There is no working life cooperation in this course.

521097S: Wireless Measurements, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Saarela

Opintokohteen kielet: English

Leikkaavuudet:

521114S Wireless Measurements 4.0 op
521114S-01 Wireless Measurements, exam 0.0 op
521114S-02 Wireless Measurements, exercise work 0.0 op

ECTS Credits:

5 ECTS credits / 128h

Language of instruction:

In Finnish or in English if two or more foreign students participate.

Timing:

Period 3.

Learning outcomes:

1. can tell and justifying argument the benefits and challenges of using wireless measurement solutions
2. can apply the most important standards when designing wireless measurement solutions
3. can apply wireless technologies in industrial, traffic, environmental, home and healthcare measurements

Contents:

Basics of wireless measurement technologies and standards, wireless sensors and sensor networks, wireless building and smart home applications, wireless measurement applications in traffic, wireless environmental measurements and wireless human health monitoring.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 22h. Seminars 6-12h depending on the number of students participating the course. The students prepare seminar presentations about contemporary topics selected by themselves or proposed by the teacher and give 10 minutes presentation to other students in the seminars.

Target group:

Master level students regardless of master's programme.

Prerequisites and co-requisites:

No prerequirements, but basics of measurements systems are recomended.

Recommended optional programme components:

The course replaces previous courses with same name, but different credits and code.

Recommended or required reading:

Lecture notes and seminar reports is Optima.

Assessment methods and criteria:

The course is passed with a written final exam (70 %) and a contemporary seminar (30 %).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grade is on numerical scale 1-5.

Person responsible:

Juha Saarela

Working life cooperation:

No.

080916S: Biomechanics of Human Movement, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: English

Status:

-

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

English

Timing:

Master´s studies, spring term 4th period

Learning outcomes:

The student can describe the main challenges of movement biomechanics and principles for motion analysis.
The student understands basics of biomechanical measurement and modeling of movement.
The student can perform practical biomechanical experiments, analyze measurement data, interpret results, and report them using good scientific reporting practice.

Contents:

Musculoskeletal biomechanics. Motion sensors and motion analysis. Biomechanical modeling of movement. Balance measurement. Fall biomechanics. Measurement of physical activity.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 14h / assignment and group work 54 h /self-study 67h. Final exam.

Target group:

Master´s students of Biomedical Engineering, medical and wellness technology, information technology and other related degree programs. Master´s students of physics (biomedical physics). Other interested master's and postgraduate students.

Prerequisites and co-requisites:

The student needs to have basic knowledge on statistical analysis, sensors and measurement techniques and signal processing. It is also recommended to have basic knowledge on anatomy and physiology.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. Tissue biomechanics will be studied in the course 080915S.

Recommended or required reading:

Material given during lectures.

Assessment methods and criteria:

Accepted home exercises and lab assignments, exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. Grading is made based on the exercise report and exam.

Person responsible:

Professor Timo Jämsä

Working life cooperation:

None

521093S: Biomedical Instrumentation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: Finnish

Leikkaavuudet:

521107S	Biomedical Instrumentation	6.0 op

ECTS Credits:

5

Language of instruction:

English.

Timing:

Period 4.

Learning outcomes:

After the course the student is capable to explain principles, applications and design of medical instruments most commonly used in hospitals. He/she can describe the electrical safety aspects of medical instruments and can present the physiological effects of electric current on humans. In addition the student is able to explain medical instrumentation development process and the factors affecting it. He/she also recognizes typical measurands and measuring spans and is able to plan and design a biosignal amplifier.

Contents:

Diagnostic instruments (common theories for medical devices, measurement quantities, sensors, amplifiers and registering instruments). Bioelectrical measurements (EKG, EEG, EMG, EOG, ERG), blood pressure and flow meters, respiration studies, measurements in a clinical laboratory, introduction to medical imaging methods and instruments, ear measurements, heart pacing and defibrillators, physical therapy devices, intensive care and operating room devices and electrical safety aspects.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures/exercises 42 h and self-study 100 h.

Target group:

Students interested in biomedical measurements.

Prerequisites and co-requisites:

None

Recommended optional programme components:

Course replaces earlier courses Biomedical measurements and Biomedical instrumentation.

Recommended or required reading:

R. S. Khandpur: Biomedical Instrumentation, Technology and Applications, McGraw-Hill, 2005 and J. G. Webster: Medical Instrumentation, Application and Design, 4th edition, John Wiley & Sons, 2010.

Assessment methods and criteria:

The course is passed by the final exam or optionally with the assignments/test agreed at the first lecture. Read more about assessment criteria at the University of Oulu webpage.

Grading:

1 - 5.

Person responsible:

Teemu Myllylä

Working life cooperation:

No.

080927S: Connected Health and mHealth, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jarmo Reponen
Opintokohteen kielet: English

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn semester period I (1st period)

Learning outcomes:

Upon completion of the course:
-The students will have knowledge about the current overall status of clinical use of health information systems and related tools (e.g. e-Health, telemedicine, Virtual Hospital, ODA-portal and other self-care portals) in Finland
-The students will have knowledge about the state of the art development in mobile health technology solutions and connected health projects.
-The students have been introduced to some practical development examples taking place in OYS Testlab and possibly in other Oulu health test labs
-The students have had an opportunity to consult with some enterprises currently working in the m-Health / Connected health domain.
-Depending on the student composition of the course, the students have learned collaboration in a multiprofessional environment in the medical information and communication technology domain.

Contents:

Terms and concepts
-overview of information and communication technology and information systems in Finnish healthcare
-new processes that activate patient: virtual hospital, self-care models
-current update about mHealth, Connected Health, Artificial Intelligence in health care, secondary use of healthcare information
-collaborative development process in multiprofessional healthcare environment
-introduction to test laboratories
-case example, depending of current R&D&I work at the time of course
-web discussions and possible group assignments

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

The implementation methods of the course vary. The course will consist of a combination of self-learning materials and activating workshops and other modules. The below mentioned amounts are approximations, because the actual contents will vary according to available development projects:
-virtual learning material in the university virtual learning environment (recorded lectures, examples, additional material) /With self-learning 40 hours of students time
-activating facilitated workshops, where the iterative innovation process is introduced to the students + introductions to the test laboratory environment + Special Key-note lectures either in the virtual environment or as participatory lectures in seminars/With self-learning 40 hours of students time
-Discussions and participation to web tasks /With self-learning 40 h of students time
-Exams and related work/15 h hours of student time

Target group:

Students of the Master´s Programs in Biomedical Engineering and Medical & Wellness Technology. The course will also be available as an elective course for medicine, health sciences, information technology and other interested degree programs.

Prerequisites and co-requisites:

None

Recommended optional programme components:

It is recommended that the student has completed the course 041201A Basics in eHealth.

Recommended or required reading:

Recommended or required reading is offered in Oulu University virtual learning environment or in linked web pages. The teachers can recommend additional material in the beginning of the course.

Assessment methods and criteria:

Web tasks, contribution to moderated discussion and workshops, and course exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1 – 5 or fail.

Person responsible:

Professor Jarmo Reponen (responsible teacher)
Professor Minna Pikkarainen
Course assistant Anna Maijala MSc

Working life cooperation:

The facilitated workshops are meant to be organized in collaboration with OuluHealth TestLabs and enterprises according to availability.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440266: Complementary Module, Software Engineering, 20 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Supplementary Module

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common studies

811372A: Software Development, Maintenance and Operations, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Mäntylä

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 1st autumn semester of the Master's studies.

Learning outcomes:

After completing the course, the student is able to:
- explain and utilize theories of software evolution
- utilize the processes, techniques and tools for software deployment, and operations
- utilize the processes, techniques and tools for software maintenance
- utilize the processes, techniques and tools to better understand and maintain large code bases

Contents:

Software Evolution. Principles and practices of software maitenance. Software operations and Devops. Software Product line engineering: Commonality and Variation.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 24 h, homework 60 h, independent study 31 h

Target group:

MSc students

Prerequisites and co-requisites:

Basics on software engineering. Basic programming skills.

Recommended or required reading:

Software Evolution and Maintenance, Priyadarshi Tripathy, Kshirasagar Naik, ISBN: 978-0-470-60341-3, 416 pages, January 2015. TODO Maëlick add the DevOps book we are currently using
DevOps: A Software Architect's Perspective (SEI Series in Software Engineering), Len Bass, Ingo Weber, Lining Zhu (ISBN: 978-0134049847), May 2015
Pohl, K., Böckle, G., van der Linden, F. Software Product Line Engineering. Foundations, Principles, and Techniques, Springer-Verlag, 2005; chapters 1-5, 10, 15, 19-20. Chastek G.J., Donohoe P., McGregor J.D., Formulation of a Production Strategy for a Software Product Line, Technical Note CMU/SEI-2009-TN-025, Carnegie Mellon, 2009. Software Evolution and Maintenance, Priyadarshi Tripathy, Kshirasagar Naik, ISBN: 978-0-470-60341-3, 416 pages, January 2015

Assessment methods and criteria:

Assignments and exercises

Grading:

Numerical scale 1-5 or fail

Person responsible:

Mika Mäntylä

Software Production

811373A: Professional Software Engineering Processes and Human Factors, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Ei opintojaksokuvauksia.

812331A: Interaction Design, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Information Processing Science DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Netta Iivari
Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 1st autumn semester of the Master's studies.

Learning outcomes:

After completing the course, the student can assess the role of human interaction with IT products, systems, and services and identify factors and problems related to it within a practical design case. The student is able to: use methods for analysis and evaluation of existing interfaces; understand the role of requirements, plan and conduct a simple requirements collection and analysis; use basic principles of usability and user experience for user interface design; use interaction design methods in designing for target user experiences.

Contents:

The course provides an overview of interaction design, introducing the terminology and fundamental concepts, the main activities, and the importance of user involvement in the design process. The course addresses establishing requirements for IT products, systems, and services. The focus is on usability and user experience from the viewpoint of the intended users, their tasks and the context of use. The course covers user-centered methods for designing for and evaluating usability and user experience of IT products, systems, and services. All the main activities of interaction design are carried out in a practical design case.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 20 h, exercises and seminar 25 h, individual and group assignments 90 h; or self-study: an opening lecture 2 h, one larger
assignment 110 h and individual tasks 21 h.

Target group:

MSc students

Prerequisites and co-requisites:

Basic knowledge on human-computer interaction with usability and user-centered design.

Recommended or required reading:

Sharp et al. (2015) Interaction Design, chapters 1-2, 4-5, 7-13 (pages 1-64, 100-157, 226-473).

Assessment methods and criteria:

Accepted assignments.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Netta Iivari

Working life cooperation:

Invited lectures, assignments.

521041A: Applied Computing Project I, 8 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Aku Visuri, Matti Pouke

Opintokohteen kielet: Finnish, English

Leikkaavuudet:

521151A	Applied Computing Project I	10.0 op

ECTS Credits:

8 ECTS credits / 216 hours of work

Language of instruction:

Finnish and English

Timing:

3rd semester (periods 1-4)

Learning outcomes:

Upon completion of the course, the student will be able to:
1. has basic understanding on how to collaboratively design a small-scale software project,
2. has basic understanding on how to implement and evaluate a small-scale software project,
3. is able to extensively document a small-scale software project,
4. is able to present and "pitch" a project work, i.e. give a good, concise presentation of the work

Contents:

The basics concepts and practices of implementing a software project in the domain of applied computing

Mode of delivery:

Fact-to-face teaching, project work in groups

Learning activities and teaching methods:

8 hours of introductory lectures. Majority of the course is guided project work

Target group:

3rd year Computer Science and Engineering B.Sc. students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Elementary Programing (521141P), Human-Computer Interaction (521145A) or corresponding skills

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Dix, Finlay, Abowd & Beale: Human-Computer Interaction (http://www.hcibook.com); Rogers, Sharp & Preece: Interaction Design: Beyond Human-Computer Interaction (http://www.id-book.com).

Assessment methods and criteria:

The course uses continuous assessment so that the project work is assessed in stages: design (20% of total grade), implementation (40%), evaluation (20%), and final report (20%). Passing criteria: all stages (design, implementation, evaluation, report) must be completed with an approved grade. Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5; zero stands for a fail.

Person responsible:

Matti Pouke and Aku Visuri

Working life cooperation:

The projects that the students will undertake are defined either by the research group or industry partners. In the projects defined by the industry, the students will carry out a development project to create a solution for the company's genuine and existing challenges. The project reports regularly to the project steering group consisting of a supervising teaching assistant as well as the company representative. In addition, the course canl have guest lectures from industry regarding collaborative software development and evaluation practices.

Other information:

The 521275A course offers the possibility to complete your Bachelor thesis in a structured course environment. The course is suitable also for students who do not use the course for their Bachelor Thesis.

817602S: Software Development in Global Environment, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppänen, Veikko Johannes

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

English

Timing:

Academic year 2019-2020

Learning outcomes:

After completing the course, the student can define the key success factors of Global Software Design (GSD) and the potential problems in coordination of projects where teams are separated by physical and / or temporal distance; can define and evaluate the collaborative technologies, which in the best way support distributed software development; can choose the methods and tools for distributed software development; can apply the practices of GSD in a student project and use the supporting tools throughout the project life cycle.

Contents:

Some of the topics covered are strategic issues in distributed development (off-shoring, near-shoring, outsourcing, OSS); cost-benefit-risk analysis; the triad of coordination, control and communication; team building (e.g. virtual teams); software process paradigms in the global environment (planned, agile); methods and tools for distributed software development; issues related to allocation of tasks; communication issues that arise due to distance and time zone differences; infrastructure support; geographical dispersion; lack of information communication; coordination complexity; cultural issues; technical issues related to information and artefact sharing; architectural design; and finally knowledge management issues. The lectures and seminars also review current research aspects of the GSD and related case studies from industry. The exercises demonstrate distributed software development as a virtual team with the support of appropriate methods and tools.

Mode of delivery:

Independent work

Learning activities and teaching methods:

An independent assignment agreed with the person responsible for the course,
professor Veikko Seppänen (Veikko. Seppanen@oulu.fi).

Target group:

MSc students

Prerequisites and co-requisites:

Basic knowledge of academic writing technique is needed. Basic understanding of software business is an advantage.

Recommended or required reading:

To be announced during the course implementation.

Assessment methods and criteria:

By active participation or alternatively exam, based on the course study materials.

Grading:

Numerical scale 1-5 or fail

Person responsible:

Veikko Seppänen

Other information:

Course does not have any lectures or exercises in academic year 2019-2020. It is still possible to do course, please sent email to Professor Veikko Seppänen veikko.seppanen@oulu.fi

815662S: Software Engineering Management, Measurement and Improvement, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Oivo, Markku Tapani

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course in the 2nd autumn semester.

Learning outcomes:

After completing the course the student understands the fundamental principles of software processes and their development in professional software engineering. The course extends the understanding of quality based on individual techniques (e.g. reviews) so that after completing the course the student is able to:
- Understand professional software development processes in agile, lean and traditional environments
- Evaluate different methods and techniques
- Select from them appropriate ones for different software engineering environments
- Have capabilities to participate in systematic efforts for improvement in software companies.

Contents:

The course covers the most fundamental process centred software quality improvement and management approaches, methods and latest research results, as well as approaches to software measurement. The topics of the course include: traditional waterfall, agile (extreme programming, Scrum, Rational unified process, crystal, feature driven development, adaptive software development, dynamic systems development method) and lean methods, process improvement approaches, software process and product measurement, agile and lean practices, process improvement at the enterprise level and practical examples from software industry.

Mode of delivery:

Face-to-face teaching + Seminars.

Learning activities and teaching methods:

9 Lectures (30 hours), 7 Seminars (30 hours), Individual weekly assignments (43 hours), Group work (30 hours).

Target group:

MSc students

Prerequisites and co-requisites:

BSc or other equivalent degree and basic knowledge of software engineering.

Recommended or required reading:

- Agile Project Management with Scrum. Ken Schwaber, Microsoft Press, ISBN 0-7356-1993-X. 2004
- Dingsøyr T., Dybå T., Moe N.B., Agile Software Development: Current Research and Future Directions, Springer, 2010
- C. Jones, Applied Software Measurement: Global Analysis of Productivity and Quality, 3rd ed. McGraw-Hill Osborne Media, 2008
- Craig Larman and Bas Vodde, Scaling Lean & Agile Development: Thinking and Organizational Tools for Large-Scale Scrum, Addison-Wesley, 2009
- CMMI: Guidelines for Process Integration and Product Improvement. Mary Beth Chrissis, Mike Konrad, Sandy Shrum. Addison-Wesley, ISBN 032-115496-7, 2004.

Assessment methods and criteria:

Active and regular participation to lectures and seminars AND report evaluation AND seminar presentations.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Markku Oivo

Working life cooperation:

Visiting lecture from industry.

521156S: Towards Data Mining, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Tamminen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish or English

Timing:

Autumn, period I.

Learning outcomes:

Student can recognize the type of the data before further analysis and the required preprocessing. The concrete learning outcomes are:
1. Student can design and implement the data gathering
2. Student can combine data from different sources
3. Student can normalize and transfor data, and handle missing or incorrect data.
4. Student can ensure the generalizability of the results.

Contents:

Course provides good ability to start Master’s Thesis or graduate studies. Topics at the course include data mining process in general level, data gathering and different data types, quality and reliability of the data, data preparation including the processing of missing values, outliers, and privacy issues, combination of signals from several sources, utilization of data bases in data mining process, and normalization and transformation of data and interdependence of the observations and their distributions. Additionally, topics concerning the generality of the results are covered, as well as, the principles of data division, for example, train-test-validate, cross-validation and leave-one-out methods.

Mode of delivery:

Lectures, independent work, group work

Learning activities and teaching methods:

16 h lectures, 16 h exercises, independent studying.

Target group:

The course is suitable for Master level students in Computer science and engineering study programmes, for minor subject studies or for doctoral students.

Prerequisites and co-requisites:

031021P Probability and Mathematical Statistics or similar

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out and exercise material will be provided. The course book will be announced in the beginning of the course. The material is mostly in English.

Assessment methods and criteria:

Weekly pre-lecture assignment + exercise submissions, and final exam. Half of the grade will be based on the submissions and half on the final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5; zero stands for a fail.

Person responsible:

Tamminen Satu

Working life cooperation:

-

Other information:

-

Information systems

813623S: Information Security Policy and Management in Organisations, 5 op

Voimassaolo: 01.08.1950 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

English

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 2nd spring semester of the Master's studies.

Learning outcomes:

After completing the course, the student is able to:
* develop BCM (Business Continuity Management) and SA (Systems Availability) strategy;

* develop organization specific information security policies in organizations;
* conduct Information Security (and risk) Analysis;
* conduct Information Security Audits;
* understand information security standards, regulations, and policies;
* improve employees’ compliance with the information security procedures through training, campaigning and other means;
* describe certifications related to information security (such as ISO27001); as well as
* describe public-key infrastructure (PKI), Digital signature, & Certification authority (CA).

Contents:

* Business Continuity Management (BCM) and Systems Availability (SA)
* Information Security Life Cycle
* Conduct Information Security (and risk) Analysis;
* Information security standards, regulations, and policies
* Information security investment management
* Insider threats in information security management
* Security Audits (Active Security Assessment)
* Information Security Certification (ISO27001) & Certification authority (CA)

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (24 h), exercises (23 h), homework (30 h), essay (20 h), examination (36 h).

Target group:

MSc students

Prerequisites and co-requisites:

Understanding of information security issues, principles, techiniques, or similar knowledge, is helpful.

Recommended optional programme components:

Recommended or required reading:

Raggad, Bel G.: Information security management, Concepts and practice, CRC Press 2010, Chapters 1, 2.7. – 2.13, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, and 15.

Assessment methods and criteria:

Examination.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Nataliya Shevchuk

521453A: Operating Systems, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521453A	Operating Systems (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish, material available in English

Timing:

Spring, period 4

Learning outcomes:

1. is capable of explaining the basic structure and functioning of operating system

2. is able to point the problems related to process management and synchronization as well as is able to apply learned methods to solve basic problems

3. is capable of explaining the cause and effect related to deadlocks and is able to analyse them related to common circumstances in operating systems

4. is able to explain the basics of memory management, the use of virtual memory in modern operating systems as well as the structure of the most common file-systems.

Contents:

Operating system structure and services, process management, process synchronization, deadlocks, memory management, virtual memory, file-systems

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures 36 h, laboratory exercise 4 h, the rest as independent work. The laboratory work, including pre-exercise and guided exercise performed in a group of one or two students in the unix environment, covers core topics of the course.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521286A Computer Systems or 521142A Embedded Systems Programming and 521267A Computer Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes (in Finnish) and exercise material. Silberschatz A., Galvin P., and Gagne G.: Operating System Concepts, 6th edition (or newer), John Wiley & Sons, Inc., 2003. Chapters 1-12.

Assessment methods and criteria:

The course is passed the final examination and accepted laboratory working.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Juha Röning and Jaakko Suutala (lectures)
Anna-Mari Wartiainen (exercises)

Working life cooperation:

-

Other information:

-

811312A: Data Structures and Algorithms, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ari Vesanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521144A Algorithms and Data Structures 6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish. One English exercise group will be arranged.

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course in the 2nd autumn semester of the Bachelor's studies.

Learning outcomes:

After completing the course the student is able to
- Select a data structure and an algorithm to an application
- Analyze correctness and time complexity of an algorithm implemented in a program
- Apply induction when proving algorithm correctness and define recursive algorithms
- Describe the most common sorting algorithms
- Describe trees, graphs and their basic algorithms, and apply them in a program

Contents:

* Basic data structures
* Analysis of algorithms
* Sorting algorithms
* Hash tables
* Binary search trees
* Graphs and their algorithms
* Algorithm design paradigms

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 48 h, exercises 21 h, exercise work 27 h, independent study 39 h.

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Databases

Recommended optional programme components:

Recommended or required reading:

Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, Second edition, MIT Press 2001 (or newer) and other material defined during the course.

Assessment methods and criteria:

1. Exam and assignment OR 2. Mid-term exams (2) and assignment

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Ari Vesanen

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440267: Complementary Module, Information Engineering, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Artificial Intelligence

521156S: Towards Data Mining, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Computer Science and Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Satu Tamminen
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish or English

Timing:

Autumn, period I.

Learning outcomes:

Student can recognize the type of the data before further analysis and the required preprocessing. The concrete learning outcomes are:
1. Student can design and implement the data gathering
2. Student can combine data from different sources
3. Student can normalize and transfor data, and handle missing or incorrect data.
4. Student can ensure the generalizability of the results.

Contents:

Course provides good ability to start Master’s Thesis or graduate studies. Topics at the course include data mining process in general level, data gathering and different data types, quality and reliability of the data, data preparation including the processing of missing values, outliers, and privacy issues, combination of signals from several sources, utilization of data bases in data mining process, and normalization and transformation of data and interdependence of the observations and their distributions. Additionally, topics concerning the generality of the results are covered, as well as, the principles of data division, for example, train-test-validate, cross-validation and leave-one-out methods.

Mode of delivery:

Lectures, independent work, group work

Learning activities and teaching methods:

16 h lectures, 16 h exercises, independent studying.

Target group:

The course is suitable for Master level students in Computer science and engineering study programmes, for minor subject studies or for doctoral students.

Prerequisites and co-requisites:

031021P Probability and Mathematical Statistics or similar

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out and exercise material will be provided. The course book will be announced in the beginning of the course. The material is mostly in English.

Assessment methods and criteria:

Weekly pre-lecture assignment + exercise submissions, and final exam. Half of the grade will be based on the submissions and half on the final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5; zero stands for a fail.

Person responsible:

Tamminen Satu

Working life cooperation:

-

Other information:

-

521289S: Machine Learning, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521497S-01	Pattern Recognition and Neural Networks, Exam	0.0 op
521497S-02	Pattern Recognition and Neural Networks; Exercise Work	0.0 op
521497S	Pattern Recognition and Neural Networks	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

English. Examination can be taken in English or Finnish.

Timing:

The course unit is held in the spring semester, during period III. It is recommended to complete the course at the end of studies.

Learning outcomes:

After completing the course, student
1. can design simple optimal classifiers from the basic theory and assess their performance.

2. can explain the Bayesian decision theory and apply it to derive minimum error classifiers and minimum cost classifiers.

3. can apply the basics of gradient search method to design a linear discriminant function.

4. can apply regression techniques to practical machine learning problems.

Contents:

Introduction. Bayesian decision theory. Discriminant functions. Parametric and non-parametric classification. Feature extraction. Classifier design. Example classifiers. Statistical regression methods.

Mode of delivery:

Face-to-face teaching, guided laboratory work and independent assignment.

Learning activities and teaching methods:

Lectures 16 h, Laboratory work 16 h, Exercise 16 h and Self-study the rest (Independent task assignment, written examination).

Target group:

Students who are interested in data analysis technology. Students of the University of Oulu.

Prerequisites and co-requisites:

The mathematic studies of the candidate degree program of computer science and engineering, or equivalent. Programming skills, especially basics of the Matlab.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Duda RO, Hart PE, Stork DG, Pattern classification, John Wiley & Sons Inc., 2nd edition, 2001. Handouts.

Assessment methods and criteria:

Laboratory work is supervised by assistants who also check that the task assignments are completed properly. The independent task assignment is graded. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. The final grade is established by weighing the written exam by 2/3 and the task assignment by 1/3.

Person responsible:

Tapio Seppänen

Working life cooperation:

No

521283S: Big Data Processing and Applications, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ekaterina Gilman

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits

Language of instruction:

English

Timing:

Period IV. It is recommended that the course is taken on the fourth year Spring.

Learning outcomes:

Upon completion of the course, the student :

1. is able to explain the big data phenomenon, its challenges and opportunities.
2. is able to explain the requirements and common principles for data intensive systems design and implementation, and evaluate the benefits, risks and restrictions of available solutions.
3. can explain the principles of big data management and processing technologies and utilize them on a basic level.

Contents:

General introduction into big data, namely: big data fundatmenals, data storage, batch and stream data processing, data analysis, privacy and security, big data use cases.

Mode of delivery:

Face-to-face teaching, independent and group work

Learning activities and teaching methods:

Lectures, exercises, seminars, independent and group work

Target group:

M.Sc. students (computer science and engineering) and other Students of the University of Oulu

Prerequisites and co-requisites:

The Bachelor level studies of Computer science and engineering study programmes or respective knowledge.

Recommended optional programme components:

Finishing 521290S Distributed Systems, 521497S Pattern recognition and neural networks, and 521286A Computer Systems is beneficial.

Recommended or required reading:

Lecture slides and exercise material will be provided. Each lecture will include the refernce list for recommended reading. Instructions to necessary installations will be given.

Assessment methods and criteria:

This course assesses students continuously by the completion of small project work, seminar presentations and short reports on a selected topic (group work). Answering two quizzes during the course is optional and provides additional points for final grade. To pass the course, it is enough to get 50 % of available points. No exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Ekaterina Gilman

Working life cooperation:

The course includes also invited lectures from industry.

811168P: Information Security, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tero Päivärinta

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811168P Information Security (OPEN UNI) 5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course in the 1st spring semester of the Bachelor's studies.

Learning outcomes:

After completing the course a student is able to
- define essential information security concepts and components of information systems security
- recognize the common types of security threats, and their managerial and technical protection mechanisms
- describe the tasks and responsibilities of information security professionals
- explain the different phases of secure systems development/acquisition
- recognize the fundamental characteristics of risk management and is evaluate information security risks
- recognize basics of technical information security methods and cryptography
- explain areas of behavioral information security research and their practical implications

Contents:

* Basic concepts of information security
* Information security threats, vulnerabilities, and risks
* Legal issues and information security frameworks
* Risk management
* Cryptography
* Information security technologies
* Behavioral information security research

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures and related quizzes or final exam 26 h, weekly assignments and scientific essay 107 h

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Introduction to Information Processing Science as well as Devices and Data Network

Recommended optional programme components:

Recommended or required reading:

Lecture materials, selected articles, and book: Whitman & Mattord (2015). Principles of information security.

Assessment methods and criteria:

Lecture tasks or exam, weekly assignments and essay.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Tero Päivärinta

Computer Science

521453A: Operating Systems, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521453A	Operating Systems (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish, material available in English

Timing:

Spring, period 4

Learning outcomes:

1. is capable of explaining the basic structure and functioning of operating system

2. is able to point the problems related to process management and synchronization as well as is able to apply learned methods to solve basic problems

3. is capable of explaining the cause and effect related to deadlocks and is able to analyse them related to common circumstances in operating systems

4. is able to explain the basics of memory management, the use of virtual memory in modern operating systems as well as the structure of the most common file-systems.

Contents:

Operating system structure and services, process management, process synchronization, deadlocks, memory management, virtual memory, file-systems

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures 36 h, laboratory exercise 4 h, the rest as independent work. The laboratory work, including pre-exercise and guided exercise performed in a group of one or two students in the unix environment, covers core topics of the course.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521286A Computer Systems or 521142A Embedded Systems Programming and 521267A Computer Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes (in Finnish) and exercise material. Silberschatz A., Galvin P., and Gagne G.: Operating System Concepts, 6th edition (or newer), John Wiley & Sons, Inc., 2003. Chapters 1-12.

Assessment methods and criteria:

The course is passed the final examination and accepted laboratory working.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Juha Röning and Jaakko Suutala (lectures)

Anna-Mari Wartiainen (exercises)

Working life cooperation:

-

Other information:

-

031023P: Mathematical Structures for Computer Science, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Matti Peltola

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031023P	Mathematical Structures for Computer Science (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn, during period 1. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

The student is able to apply result of logic to find the truth value of logical statement and can express sentences of natural language by symbols of logic.. He/She can use arithmetic operations on different number bases. The student recognize the main types of graphs and understand the basis concepts of graphs and is able to apply formal methods of discrete mathematics to model simple information processing problems.

Contents:

1. Elementary logic 2. Mathematical induction 3. Elementary number theory 4. Set theory 5. Elementary graph theory 6. Elementary theory of formal languages 7. Theory of automata and Turing machines

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 14 h / Self-study 93 h.

Target group:

2. year students of computer science.

Prerequisites and co-requisites:

No prerequisites

Recommended optional programme components:

-

Recommended or required reading:

Recommented literature: Rosen K.H.: Discrete Mathematics and Its Applications. Gersting J.L.: Mathematical Structures for Computer Science.

Assessment methods and criteria:

The course can be completed by intermediate exams (2 exams) or by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail

Person responsible:

Matti Peltola

Working life cooperation:

-

521286A: Computer Systems, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Leppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521142A	Embedded Systems Programming	5.0 op

ECTS Credits:

8 ECTS cr

Language of instruction:

Lecturing in Finnish, course and exercise material available in English.

Timing:

Autumn, periods 1-2.

Learning outcomes:

After completing the course
Student understands the basic computer architecture and organization.
Student understands CPU operation and basic datapath operation.
Student knows different number systems and data representations in computers.
Student is familiar of I/O operation with peripheral devices in general.
Student is able to implement small programs with the C programming language for general-purpose computers for embedded systems.
Student is able to implement small assembly language programs.
Student recognizes how embedded systems programming is different from programming general-purpose computers.

Contents:

Overview of computer architecture and organization, CPU and datapath, memory hierarchies, data types, interrupts, registers and I/O, basics of the C programming language and basics of assembly language. Embedded systems programming.

Mode of delivery:

Web-based and face-to-face teaching.

Learning activities and teaching methods:

Lectures (32h), course exercises (10-30h), laboratory exercise (3h) and two course projects, one is completed in a group and the other alone.

Target group:

2nd year students of computer science and engineering and 3rd year students of electrical engineering.

Prerequisites and co-requisites:

Elementary programming 521141P.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes and exercise material are available in the course website. Literature:
Bryant & O'Hallaron, Computer Systems: A Programmer's Perspective, 3rd Edition, Chapters 1-9.
Patterson & Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5th Edition, Chapters 1-2, 4-5.

Assessment methods and criteria:

The assessment criteria is based on the learning outcomes of the course. Students complete the course exercises, participate to the laboratory exercise and complete the course projects. Assessment is based on the exercises and the course projects. More detailed information on assessment is published in the lecture material.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Teemu Leppänen

Working life cooperation:

Visiting lectures with experts from local industry are possible.

521043S: Internet of Things, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ella Peltonen

Opintokohteen kielet: English

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

English

Timing:

Spring semester during period IV

Learning outcomes:

Upon completion of the course, the student will be able to:
1. explain application areas of IoT and requirements from such application areas for IoT systems.
2. will be able to explain the state-of-the-art IoT solutions, and understand the basic technologies behind them.
3. learn the principles of the novel IoT technologies and know important directions IoT research towards.

Contents:

The basic technologies and novel applications of the Internet of Things, including networking technologies as well as Web of Things. IoT sensor technologies and sensing solutions for smart buildings including smart home, city, office, or campus environments, and wearables and other personal devices such as fabrication. Exercises will include hands-on programming and sensing data analytics tasks.

Mode of delivery:

face-to-face teaching and exercises (both individual and group work)

Learning activities and teaching methods:

20h lectures, 12h exercise sessions, independent studying 95 hours.

Target group:

M.Sc. students of Computer Science and Engineering, M. Sc. students of Ubicomp International master program. The course fits also for Statistics and Math MSc student interested in applying their knowledge into sensing and IoT data.

Prerequisites and co-requisites:

The Bachelor level knowledge of Computer science and engineering study programmes. Good programming skills in a chosen language.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out, complementary reading list, and exercise material will be provided.

Assessment methods and criteria:

Attending lectures and exercise sessions, and returning the weekly exercises online.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Ella Peltonen

Working life cooperation:

The course may include the invited guest lectures from industry and other top EU universities.

Other information:

Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi

521348S: Statistical Signal Processing 1, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Lehtomäki, Juntti, Markku Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

521484A	Statistical Signal Processing	5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 1st semester of the master studies.

Learning outcomes:

Upon completion the student

1. knows the key tools of linear algebra and optimization and can apply them in solving signal processing problems.
2. understands the key concepts in estimation theory such as the classical and Bayesian framework.
3. masters the most important estimation principles such as minimum variance, maximum likelihood, least squares and minimum mean square error estimators.
4. can derive an estimator for a given criterion and basic data models.
5. can use the methodology of estimation theory to analyze the performance of estimators

6. understands the basics of detection and classification theory: hypothesis testing, receiver operating characteristics (ROC), matched filtering, estimator-correlator

Contents:

Review of probability, linear algebra, random variables and stochastic processes; SVD (Singular value decomposition), QR decomposition, estimation theory, minimum variance unbiased estimator, Cramer-Rao lower bound, linear models, general minimum variance unbiased estimation, best linear unbiased estimators, maximum likelihood estimation, least squares estimation, Bayesian estimation, linear Bayesian estimation, Wiener filters, statistical decision theory, receiver operating characteristics, hypothesis testing, matched filter, estimator-correlator.

Mode of delivery:

Face-to-face teaching and e-learning tool usage

Learning activities and teaching methods:

Face-to-face-teaching (lectures and exercises) 50h, Matlab simulation exercises in groups 30 h, independent work & passed assignment 50 h.

Target group:

Electrical, communications and computer science and engineering students.

Prerequisites and co-requisites:

The required prerequisite is the completion of the following courses prior to enrolling for the course: 031080A Signal Analysis, 031021P Probability and Mathematical Statistics, 031078P Matrix Algebra, 521330A Telecommunication Engineering.

Recommended optional programme components:

521323S Wireless communications I and 031051S Numerical Matrix Analysis are recommended to be taken in parallel.

Recommended or required reading:

Parts from books:
1. Steven M Kay, "Fundamentals of statistical signal processing, volume I: estimation theory." Prentice Hall 1993.
2. Steven M. Kay, "Fundamentals of statistical signal processing: Detection theory, vol. 2." Prentice Hall 1999.
3. Umberto Spagnolini, Statistical Signal Processing in Engineering 2017.
4. Paolo Prandoni & Martin Vetterli, Martin, “Signal Processing for Communications”, CRC Press 2008.
5. Other literature, lecture notes and material.

Assessment methods and criteria:

Completing the simulation project tasks, and a mid-term exam during the course. The mid-term exams can be retaken by a final exam later. In the final grade of the course, the weight for the examination is 0.7 and that of project report 0.3.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero (0) stands for a fail.

Person responsible:

Janne Lehtomäki and Markku Juntti

Working life cooperation:

No

Other information:

-

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440264: Complementary Module, Mining Technology and Mineral Processing, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

493300A: Principles of mineral processing, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Saija Luukkanen
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

ay493300A	Principles of mineral processing (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish; material mainly in English

Timing:

2nd period in the autumn. Recommended for the 3rd year students.

Learning outcomes:

Upon completion the course the student can explain the main unit process used in ore beneficiation and understands teh main chemical and mineralogical factors palying the key role in process development. The student is able to calculate the most relevant process related calculations, such as mass balances, concentrate recoveris and grindability. The student is aware of the environmental as well as H&S aspects of mineral processing.

Contents:

The main unit processes used in mineral processing. Understanding how the mineralogy and chemistry of the ore influences in the process development.

Mode of delivery:

Mainly face-to-face teaching

Learning activities and teaching methods:

Lectures, demonstrations, assignments

Target group:

Student with mineral processing as major; students of mining engineering, geosciences and process engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

The material provided during the course. B.A. Wills: Mineral processing technology

Assessment methods and criteria:

Final exam, home works and practicals, energy

Grading:

1-5/fail

Person responsible:

Saija Luukkanen

Working life cooperation:

No

Other information:

-

493302A: Chemical phenomena in mineral processes, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Saija Luukkanen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish, course material in English

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course at the 3rd spring semester

Learning outcomes:

Upon succesfull completion student can explain physical-chemical phenomenons (especially surface and electro chemical) affecting various unit operations in mineral processing. Student can also describe general phases in mineral processing and unit operation from standpoint of physical chemistry.

Contents:

Basic equations in thermodynamics; chemical interactions especially in interfaces; electrochemical interactions.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

32 h lectures and practicals

Target group:

Major students in Mining engineering and mineral processing, minor subject students in Geosciences and Process engineering.

Prerequisites and co-requisites:

493300A Principles of Mineral Processing

Recommended optional programme components:

-

Recommended or required reading:

Lecture and electronic material

Assessment methods and criteria:

Final exam, practicals, activity

Grading:

1-5/fail

Person responsible:

Saija Luukkanen

Working life cooperation:

No

Other information:

-

772335A: Introduction to ore mineralogy, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Shenghong Yang, Eero Hanski
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS

Language of instruction:

The language of instruction is English.

Timing:

The course is held in the autumn semester, during period I. It is recommended to complete the course at the 2nd or 3rd autumn semester.

Learning outcomes:

Upon completion of this course, the student will:
obtain basic knowledge on ore minerals and their mode of occurrence
learn to recognise the most common ore minerals and textures under the ore microscope.

Contents:

Division and structure of ore minerals, composition and texture, phase diagrams and their applications. Ore microscope and how it is used, microscopic properties of ore minerals. Identification of ore minerals and ore mineral assemblages.

Mode of delivery:

Face to face teaching.

Learning activities and teaching methods:

14 h lectures, 21 h exercises.

Target group:

All students in geosciences and mining engineering and mineral processing.

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: 771102P Basic mineralogy, 772339A Optical mineralogy.

Recommended optional programme components:

The course in an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Textbook: Craig, J.P. & Vaughan, D.J. (1994) Ore Microscopy and Ore Petrography. Wiley & Sons, 2nd ed. 434 p.
Other handbook-type literature supporting the microscope excercises: Wiley & Sons, 2nd ed. 434 p. Ramdohr, P. (1980) The Ore Minerals and their Intergrowths, vol. 1 and 2. Pergamon Press, 1205 p. Spry P.G. & Gedlinski B.L. (1987) Tables for Determination of Common Opaque Minerals. Economic Geology Publishing Co. 52 p. Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed. 992 p. Nesse W.D. (2012) Introduction to Mineralogy, Oxford University Press. 480 p. Pracejus B. (2008) The ore minerals under the microscope – An optical guide. Atlases in Geosciences 3, Elsevier, 875 p.
The availability of the textbooks can be checked via this link.

Assessment methods and criteria:

Examinations in both theory and calculations.

Grading:

In the theory exam grade and final grade, the course utilizes a numerical grading scale of 1-5. Zero stands for a fail. In the microscope exam, the course utilizes verbal grading pass/fail.

Person responsible:

Shenghong Yang

Working life cooperation:

No.

493605S: Ore benefication technologies, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English, Finnish

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn semester, during period II. It is recommended to complete the course at the 1st autumn semester

Learning outcomes:

Upon completion of the course students should be able to:

- Describe the principles and applications of the main mineral processing technologies
- Describe the variables effecting on the selection of the process technique and evaluate the most suitable technique for processing different types of materials based on their composition
- Understand the nature of the feed material and its influence in process selection, mineral processing technologies used in selected cases and process optimization
- Use design and optimization methods for applying in beneficiation plants

Contents:

Contents:

- Module 1: Introduction to minerals and mineralogy
- Module 2: Introduction to Mineral Processing Technology
- Module 3: Comminution - Size reduction
- Module 4: Beneficiation Technologies - Physical separation techniques
- Module 5: Physic-chemical separation techniques
- Module 6: Solid Liquid Separation
- Module 7 Case study of optimization

- Module 8: Seminar (assignment, laboratory work and findings in paper review)

Additionally it is included
Practice Ore characterization in optical microscopy
Laboratory test in crushing and grinding, PSD
Laboratory test of flotation
Laboratory test of sedimentation

Mode of delivery:

Classroom education, face to face teaching

Learning activities and teaching methods:

Lectures during one period.
Lectures 36 h / Laboratory tests 8 h/Group work 16 h/Self-study includes exercises and assignments 75 h

Target group:

Mineral processing majors, minor subject students and other form Oulu Mining School and Technology

Prerequisites and co-requisites:

493300A Principles in Mineral Processing, 493302A Chemical Phenomena in Mineral processing

Recommended optional programme components:

The course is an independent entity and does not require additional studies out at the same time

Recommended or required reading:

Wills & Napier-Munn: Mineral processing technology; Elsevier Science & Technology Books, ISBN: 0750644508
Gupta, A., Yan, D.S. (2006). Mineral Processing Design and Operation and Introduction
Articles and references given during the course

Assessment methods and criteria:

Continuous assessment during lectures, exercises, seminar, reports, papers review. Major students participate in a seminar peer review as the assessment method.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Maria Sinche Gonzalez

Working life cooperation:

No

Other information:

Due to continuous assessment used in this course, it is highly recommended that the students are present already in the first lecture.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440255: Supplementary Module, Mechanical Engineering, 20 - 30 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Supplementary Module

Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common courses

462107A: Maintenance of machines, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jouni Laurila
Opintokohteen kielet: Finnish
Leikkaavuudet:

464087A-01 Maintenancy Technology, examination 0.0 op
464087A-02 Maintenancy Technology, exercise work 0.0 op
464087A Maintenancy Technology 5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 3rd spring semester.

Learning outcomes:

Upon completion of the course, the student knows the different types of maintenance execution and can introduce what kind of points are connected to the choice of the maintenance strategy. The student knows the most common machine failure modes and consequences of them and can tell how the failures can be prevented. The student will recognize the effects of wearing and lubrication on the condition of machines and he/she is capable of explaining the basic concepts related to analysis of lubricants. The student knows the basics of the vibration measurement which are used in the condition monitoring of machines and can choose the suitable measuring and analysis methods for the identification of the most common machine faults. The student is familiar with the significance of maintenance in the productional operation and he/she is able to apply the most important standards of the maintenance field.

Contents:

Maintenance strategies and organizing methods, standards of this field, failure modes, wearing and lubrication, basics and the most general methods of machine condition monitoring

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 24 h / group work 36 h / self-study 75 h

Target group:

Bachelor's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462103A Introduction to Maintenance

Recommended optional programme components:

The course is an independent entity

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Järviö, J. et al., Kunnossapito. Helsinki, KP-Media Oy / Kunnossapitoyhdistys ry 2007. Antila, K., et al., Teollisuusvoitelu, KP-Media Oy, 2003. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jouni Laurila

462109S: Simulation and modelling of machines, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462055S-01	Virtual Engineering of Mechatronic Products, examination	0.0 op
462055S-02	Virtual Engineering of Mechatronic Products, exercise work	0.0 op
462055S	Virtual Engineering of Mechatronic Products	5.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 4th spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to create a simulation model consisting of rigid bodies using Adams and MATLAB/Simulink software. The student is able to interpret the simulation results and is also able to evaluate the validity of the results. The student is able to design submodels of complex systems and he/she is able to explain the principles of creating a more complex simulation model. In addition to this, the student is able to evaluate the extent of modelling process of various kinds of engineering systems.

Contents:

Basics of virtual design; ADAMS simulation software principles and basic usage; Creation and usage of multibody systems comprised of rigid bodies; Kinematic and dynamic analysis; Determination of actuator motion paths and velocities as well as determination of loads; Modelling and simulation of control systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 32 h / Self-study 149 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture handout. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

521043S: Internet of Things, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ella Peltonen

Opintokohteen kielet: English

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

English

Timing:

Spring semester during period IV

Learning outcomes:

Upon completion of the course, the student will be able to:
1. explain application areas of IoT and requirements from such application areas for IoT systems.
2. will be able to explain the state-of-the-art IoT solutions, and understand the basic technologies behind them.
3. learn the principles of the novel IoT technologies and know important directions IoT research towards.

Contents:

The basic technologies and novel applications of the Internet of Things, including networking technologies as well as Web of Things. IoT sensor technologies and sensing solutions for smart buildings including smart home, city, office, or campus environments, and wearables and other personal devices such as fabrication. Exercises will include hands-on programming and sensing data analytics tasks.

Mode of delivery:

face-to-face teaching and exercises (both individual and group work)

Learning activities and teaching methods:

20h lectures, 12h exercise sessions, independent studying 95 hours.

Target group:

M.Sc. students of Computer Science and Engineering, M. Sc. students of Ubicomp International master program. The course fits also for Statistics and Math MSc student interested in applying their knowledge into sensing and IoT data.

Prerequisites and co-requisites:

The Bachelor level knowledge of Computer science and engineering study programmes. Good programming skills in a chosen language.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture hand-out, complementary reading list, and exercise material will be provided.

Assessment methods and criteria:

Attending lectures and exercise sessions, and returning the weekly exercises online.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Ella Peltonen

Working life cooperation:

The course may include the invited guest lectures from industry and other top EU universities.

Other information:

Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi

Machine Design

462103A: Introduction to Maintenance, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the most important terms related to the field of maintenance, define what the maintenance is and to tell how it affects on productivity, safety and environment. After the course, the student is able to calculate the most important factors and indicators related to the reliability and classify maintenance actions to corrective and predictive operations. In addition, he/she knows how the maintenance must to take into consideration during different planning tasks.

Contents:

The basic concepts, objectives and effects of the maintenance

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h / group work 20 h / self-study 83 h

Target group:

Bachelor's degree students in the mechanical engineering

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Järviö, J. et al., Kunnossapito. Helsinki, KP-Media Oy / Kunnossapitoyhdistys ry 2007.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462101A: Information technology and machines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain how the information technology is utilized in modern machines. The student is able to describe how the modern machines are developed from purely mechanical systems to multi-disciplinary systems. The student is able to sort out the electrical, information technological and mechanical features of modern machines. He/she is also able to describe the interaction and interfaces of the aforementioned features. In addition to this, the student is able to separate the digital and analog domains. The student is able to create a simple computer program for machine control. He/she is able to name the sensors and actuators being used in automated machines. Furthermore, the student is able to list examples of machines taking advantage of modern information technology.

Contents:

History of mechanical engineering and information technology; Information technology as an enabler of the development of machines; Requirements and boundary conditions for automatisation of machines; Concepts of information technology and electronics; Basics of programming and logical reasoning; Examples of machine applications taking advantage of modern information technology.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 20 h / Group work 12 h / Self-study 101 h

Target group:

Bachelor's degree students of mechanical engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are exercises and intermediate exams. The exercises and the exams will be assessed. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the role of actuators in a typical machine automation system. The student is able to recognize various kinds of actuators and is able to classify them according to performance and usability. In addition to this, the student is able to design a simple hydraulic drive and is he/she is able to select a suitable actuator for a typical automation application. Furthermore, the student is able to assess actuator sensing needs and preconditions to work as a part of automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Yrjö Louhisalmi

464105S: Computer aided design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Korpela

Opintokohteen kielet: Finnish

Leikkaavuudet:

462044S-01 Computer Aided Design, examination 0.0 op

462044S-02 Computer Aided Design, exercise work 0.0 op

462044S Computer Aided Design 3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures and exercises arranged spring during periods 3.

Learning outcomes:

The aim of the course is to teach for students how the computer systems are used in different fields of mechanical machine design. After the course, the student is able to define whatcomputer systems belong to the customer centered computer integrated manufacturing. He/she is able to explain what design knowledge is produced in these systems and what design knowledge is transferred between these systems. The student is able to use the CAD/CAM system used in the course in different fields of mechanical machine design.

Contents:

The course will focus on the use of computer systems in different fields of mechanical machine design. The emphasis is on the utilization of product data and the realization of product based design systems, where there is often a need to integrate many systems functionally together

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h / exercises 30 h / practical work 83 h

Target group:

4th year master degree student of mechanical engineering.

Prerequisites and co-requisites:

Machine Drawing and CAD, Design of Machine Elements.

Recommended or required reading:

Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, Inc.: New York, 1999, 581 s.

Assessment methods and criteria:

Final exam and practical work. Final exam will be 40% and practical work 60% of final grade.

Grading:

: Numerical grading scale 1-5 / fail

Person responsible:

University Lecturer Tapio Korpela

462105A: Machine Sensor Technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462053A	Sensor Technology of Machine Automation	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able identify, classify and bring into use the most common sensor types used in machine automation. The student is able to choose sensors for typical automation applications. In addition to this, the student is able to design a common analog and digital signal transmission and conditioning chain.

Contents:

Basics measuring systems; Classification of sensors; Characteristics of analog and digital domain; Analog to digital conversion; Basics of analog signal conditioning: amplification, attenuation and filtering; Operating principle of digital sensors; Examples of typical sensors used in mechanical engineering and civil engineering;

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p. Chapters 4-7; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462111S: Machine diagnostics, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464088S	Diagnosis of Machine Condition	8.0 op
464088S-01	Diagnosis of Machine Condition, examination	0.0 op
464088S-02	Diagnosis of Machine Condition, exercises	0.0 op

ECTS Credits:

10 ECTS credits / 267 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 4th spring semester.

Learning outcomes:

: Upon completion of the course, the student is capable to utilize the different methods of the machine diagnostics and use the most common measuring devices in the finding out the operation and condition of machines. He/she is able to apply the most important features and signal processing methods which are used in the condition monitoring and he/she can analyse the frequency contents of signals to clarify the problems which are related to the operation of machines. The student is able to draw up a measurement plan, carry out the measurements and report the obtained results. The student can use the standards of this field as help in the evaluation of the condition of machines and severity of vibrations. He/she is able to perceive what kind of significance the machine diagnostics has to the success of the maintenance and productivity.

Contents:

The most important methods and measuring techniques which are used in the machine diagnostics, the analysis of machine vibration and faults diagnosis, the most important signal processing methods, measurement planning, realisation and reporting, dynamic balancing of machines, standards of this field

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462107A Maintenance of Machines

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3 – Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jouni Laurila

Mechatronics

521077P: Introduction to Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521077P	Introduction to Electronics (OPEN UNI)	5.0 op
521209A	Electronics Components and Materials	2.0 op

ECTS Credits:

5 ECTS credits / 132,5 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the 1st period. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

1. Student understands the block structures of electronic devices and their signal processing paths.

2. Student can identify the interfaces of analog and digital electronics and the software operations.

3. Student is able to identify and classify electronics components and compare their properties.

4. Students can describe electric conductivity and apply the phenomenon on designing and choosing resistors

5. Student is able to estimate the difference between dielectric materials and how they affect the properties of a capacitor.

6. Student can compare properties of magnetic materials and how identify they effect on inductive components.

7. Student can identify semiconductivity and is able to list typical semiconductor components.

8. Student can classify different circuit board techniques and is able to choose proper coupling techniques.

9. Student can identify the future technologies of electronics materials.

Contents:

Structures and interfaces of electronic devices. Electromagnetic properties of materials (conductivity, dielectricity, magnetism and semiconductivity).Electronics components (resistors, capacitors, inductive components and semiconductors). Interconnection technologies and circuit board technologies. The future of electronic materials and application areas.

Mode of delivery:

Face-to-face teaching and independent work.

Learning activities and teaching methods:

The implementation methods of the course vary. The course will be arranged utilizing activating teaching methods agreed on together with the students. There will be 48 hours of guided teaching events and 84.5 hours of teaching without guidance either privately or in a group.

Target group:

First year electrical engineering students.

Prerequisites and co-requisites:

No prerequisites.

Recommended optional programme components:

-

Recommended or required reading:

Lecture material; Materials science and engineering: an introduction / Willam D. Callister, chapters 1, 18 and 20; Electronic components and technology / S. J. Sangwine. Chapters 1,2,3,5 and 7

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are two intermediate exams. In addition students will make course work which are graded. The assessment of the course is based on the learning outcomes of the course. Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jari Hannu

Working life cooperation:

No

Other information:

-

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Spring, period 4

Learning outcomes:

After the course the student can

1. write and solve the equations describing the operation of a given electrical circuit

2. solve the sinusoidal steady-state solution using complex phasor arithmetics

3. solve time responses of electric circuits

4. simplify electrical circuits e.g. using equivalent circuits

5. simulate simple circuits and choose an appropriate circuit simulation method

Contents:

Equation of basic circuit elements, circuit laws and systematic building of network equations. Calculation of time and frequency responses. Use of complex phasor arithmetics. Basics of the use of circuit simulators.

Mode of delivery:

Classroom.

Learning activities and teaching methods:

30h lectures, 22h exercises, and a simulation exercise.

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Matrix algebra, complex arithmetics, differential equations.

Recommended optional programme components:

Background to all analog electronics cources.

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 1-11.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed
Read more about assessment criteria at the University of Oulu webpage..

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

461106A: Dynamics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Koivurova Hannu
Opintokohteen kielet: Finnish
Leikkaavuudet:

461018A-01	Dynamics, examination	0.0 op
461018A-02	Dynamics, exercises	0.0 op
461018A	Dynamics	4.0 op

ECTS Credits:

5 ECTS credits / 120 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 2st spring semester.

Learning outcomes:

The aim of this course is to provide students with the ability to examine the relationship between the forces on a solid body and the resulting motion, position, speed and acceleration of the body. Learning outcomes: Upon completing the required coursework, the student knows and is able to explain the fundamental quantities and the base laws of the classical mechanics. He/she is able to choose an appropriate coordinate system and analyze the motion - position, velocity, and acceleration - of the parts of a device. The student is able to draw a free body diagram of a moving system, and compose and derive the equations of motion for a system using the direct momentum method, the work-energy method, and the impulse-momentum method.

Contents:

Introduction; Kinematics of a particle; Plane kinematics of a rigid body; Kinetics of a particl;. Basics of mechanical vibrations; Kinetics of a system of particles; Plane kinetics of a rigid body.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 45 h / Exercise 30 h / Self-study 45 h.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T. (2003) Dynamiikka 1, kinematiikka, Pressus; Salmi, T. (2002) Dynamiikka 2, kinetiikka, 2. p., Pressus. Oheiskirjallisuus: Salonen, E.M. (2000) Dynamiikka I, 8. korj. p., Otatieto; Salonen, E.M. (1999) Dynamiikka II, 8. korj. p., Otatieto; Beer, F., Johnston, E.(2007) Vector Mechanics for Dynamics, 9.ed., McGraw-Hill

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are three intermediate exams. In addition to this, the students will be asked to calculate homeworks, and theses homeworks will be assessed. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Optima Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer Hannu Koivurova

462110S: Advanced course in mechatronics, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462052S	Advanced Course in Mechatronics	8.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to analyze and design mechatronic products using modern calculation and simulation methods. The student is able to choose the appropriate technology for a mechatronic system. He/she is also able to compare the various technologies. In addition to this, the student is able to assess the feasibility, performance and preconditions of different kinds of actuators in mechatronic products.

Contents:

Technology of digital control systems; Characteristics of dynamical systems and their behavior in time and frequency domain; Modelling and simulation of mechatronic systems; Basics of advanced vibration damping systems and their control; Modelling of friction; Experimental research of mechatronic systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 16 h / Group work 32 h / Self-study 165 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation, Mechatronics, Simulation and Modelling of Machines

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars, assignment and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

521160P: Introduction to Artificial Intelligence, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Olli Silven

Opintokohteen kielet: English

Leikkaavuudet:

ay521160P	Introduction to Artificial Intelligence (OPEN UNIV)	5.0 op

ECTS Credits:

5 ECTS credits /135 hours of work

Language of instruction:

The language of instruction is Finnish with part of the material in English. The course is implemented as exercises done by groups of participants.

Timing:

The course is held during the period IV in the Spring semester, and it is recommended for the 1st or 2nd year.

Learning outcomes:

Upon completion the student the student will have the elementary skills to identify the potentially applicable artificial intelligence techniques for solving problems. He/she is able to recognize search, regression, classification, and clustering problems, and to explain the use of supervised and nonsupervised learning, performance measurements and metrics.

Contents:

1. Introduction: the role of artificial intelligence
2. Search methods: artificial intelligence in games
3. Regression methods: learning of causalities
4. Classication methods: recognition of categories
5. Clustering methods: identification of category structure
6. Supervised learning
7. Unsupervised learning

Mode of delivery:

The course is implemented face-to-face teaching

Learning activities and teaching methods:

Lectures 42h / group work 70 h / elf-study 23 h. The exercises are completed as group work in multi-disciplinary teams.

Target group:

The course is suitable for all students, but due to the nature of the exercises some elementary programming skills are needed in each student group.

Prerequisites and co-requisites:

No prerequisites

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

The course is modeled loosely based on the University of Washington’s Coursera module “Machine learning foundations: a case study approach”

Assessment methods and criteria:

The course utilizes continuous assesment. During the course there are 6 intermediate exams of which 5 best ones will be used in final evaluation. The course includes 5 group exercises of which at least 4 need to be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Olli Silvén

Working life cooperation:

The course includes guest presentations on the artificial intelligence applications

Production engineering

462104A: Machine automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462022S-01 Machine Automation II, examination 0.0 op

462022S-02 Machine Automation II, exercise work 0.0 op

462022S Machine Automation II 5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the basic principles and structures of a typical machine automation system. The student is able to divide an automation system into basic elements and explain their role and significance in the system. The student can apply the basic digital technology and logic methods in designing a typical machine automation system. In addition to this, the student knows the operating principles of programmable logic controllers (PLCs) and is able to implement a logic control for a typical application. Furthermore, the student is able to explain the basic principles of fieldbuses.

Contents:

Basics of automation; Basics of digital technology and logic; Description of operation sequences; Architecture of programmable logic controllers and their programming; Distributed systems and fieldbuses.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. However, it is recommended to complete the course Machine Sensor Technology simultaneously.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Yrjö Louhisalmi

463104A: Advanced manufacturing methods, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463068S-01	Laser Processing, examination	0.0 op
463068S-02	Laser Processing, exercises and seminari	0.0 op
463068S	Laser Processing	3.5 op

ECTS Credits:

7 cr / 187 hours of work

Language of instruction:

Finnish, the course can also be completed in English

Timing:

Organized during the autumn semester. Lectures and seminar during period 1, demonstrations and practical work during period 2.

Learning outcomes:

The student can apply laser machining processes, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes in today's machine shops as well as choose suitable equipment for various applications. The student can also describe the main features, capabilities, limitations and trends of the aforementioned processes.

Contents:

Classes and seminars deal with the fundamentals and equipment of laser material processing, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes. Other processes may be added as deemed suitable. Material interaction, process and equipment possibilities and limitations. Additionally, safety and health aspects of the processes are covered.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures and seminars 46h, preparation for the seminars 34h, demonstrations 10h, practical work as a group project 70h, final exam 3h and preparation for the exam 24h. The project work is flexible and enables realization of student-initiated project ideas.

Target group:

Mechanical engineering students in their Master's studies, 5th year.

Recommended optional programme components:

Production technology studies in general.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Ion, J.C. Laser Processing of Engineering Material, Elsevier 2005. Steen, W.K. Laser Material Processing, Springer 2003.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.4), seminar and practical work (0.6).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering. Methods covered in the course are alternative or supplementary to traditional manufacturing methods.

463109S: Computer aided manufacturing, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463059S-01	Computer aided manufacturing, examination	0.0 op
463059S-02	Computer aided manufacturing, exercise work	0.0 op
463059S	Computer Aided Manufacturing	4.0 op

ECTS Credits:

7 ECTS

Language of instruction:

Finnish

Timing:

Lectures and exercises at period 2.

Learning outcomes:

The aim of this course is for the student to obtain the basic knowledge of computer-assisted manufacturing by lectures, demonstrations and practical projects. After the course the student knows how to utilize computer-aided methods and systems with different manufacturing processes in machine shops. The student can describe the main features, capabilities and limitations of different methods and processes as well as the trends of computer-aided manufacturing. Additionally, the student can apply his/her knowledge to solve practical problems.

Contents:

Application areas and interfaces in integrated, computer-aided manufacturing of mechanical parts; programming and simulating numerically controlled (NC) production machinery and processes; creating and processing of control information in NC manufacturing. Integration between NC-machine tools, NC-programming systems and manufacturing systems. Flexible manufacturing. Product data management. Analyzing and compensation of machining errors. Methods for surface and shape measuring. Methods, processes and control of rapid manufacturing. In project section of the course the knowledge is applied to solve practical problems in manufacturing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises.

Prerequisites and co-requisites:

463102A Production Technology I.

Recommended or required reading:

Course notes (mainly in Finnish); Contemporary articles and publications. Supplementary material will be given during the lectures. Reference reading: Chang, T-C. & al. Computer-aided manufacturing, Prentice Hall, 2006. Dowden, J.M.The Mathematics of Thermal Modeling, Chapman & Hall, 2001. Hosford, W.F. & Caddel, R.M. Metal forming, Cambridge University Press, 2007 Ion, J.C. Laser processing of engineering materials, Elsevier, 2005, 556 p. Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, 1999, 432 p.

Assessment methods and criteria:

Final exam.The final grade is based on the combined points from the exam (grade 0.6) and exercises (grade 0.4).

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440249: Supplementary Module, Process Engineering, 20 - 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Process engineering

477304A: Separation Processes, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Muurinen, Esa Ilmari
Opintokohteen kielet: Finnish
Leikkaavuudet:

470323A	Separation Processes	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work.

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in autumn semester during the 2nd period. It is recommended to complete the course on the third (Bachelor's) autumn semester.

Learning outcomes:

After the course the student is able to define the position of separation processes based on mass transfer in process and environmental engineering. He/she is capable of solving phase equilibrium problems in multistage separations for binary mixtures. The student is able to explain the phenomena behind the following separation processes: distillation, absorption, stripping, liquid-liquid extraction, supercritical extraction, crystallisation, adsorption, chromatography separation, membrane separations, and reactive separations. He/she recognises the equipment used for these processes and is able to compare the methods to each other with heuristic rules.

Contents:

Separation processes based on mass transfer in process and environmental engineering. Phase equilibrium problems in multistage separations for binary mixtures. Phenomena behind the following separation processes: distillation, absorption, stripping, liquid-liquid extraction, supercritical extraction, crystallisation, adsorption, chromatography separation, membrane separations, and reactive separations. Equipment used for these processes and is able to compare the methods to each other with heuristic rules, etc.

Mode of delivery:

Face-to-face teaching in Finnish. Book examination possible in English.

Learning activities and teaching methods:

Lectures 40 h, exercises 20 h, homework 15 h and self-study 58 h. For foreign students written examination based on given literature and homework.

Target group:

Bachelor's degree students of process and environmental engineering.

Prerequisites and co-requisites:

Courses 477301A Momentum Transfer, 477302A Heat Transfer and 477303A Mass Transfer or 477052A Fluid Mechanics and 477312A Heat and Mass Transfer are recommended beforehand.

Recommended optional programme components:

This is one of the courses in which physical chemistry is used in the applications of process and environmental engineering. It is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Seader, J.D., Henley, E.J. & Roper, D.K.: Separation Processes Principles. Wiley 2011, 821 p.; Noble, R. D. & Terry, P.A.: Principles of Chemical Separations with Environmental Applications. Cambridge 2004, Cambridge University Press.321 p.

Assessment methods and criteria:

Homework assignments affect the course grade. Examination. The course can be completed with two intermediate exams or one final exam. Homework assignments affect the course grade. Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Laboratory manager Dr Esa Muurinen

Working life cooperation:

No

Other information:

-

477203A: Process Design, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jani Kangas

Opintokohteen kielet: English

Leikkaavuudet:

480310A	Fundamentals of Process Design	5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

Period 4

Learning outcomes:

The student is able to identify the activities of process design and the know-how needed at different design stages. The student is capable of utilising process synthesis and analysis tools for creating a preliminary process concept and pointing out the techno-economic performance of the process concept based on holistic criteria.

Contents:

Acting in process design projects. Safety and environmentally conscious process design. Design tasks from conceptual process design to plant design, especially the methodology applicable for preliminary process and plant design.

Mode of delivery:

Lectures and process design exercises in groups.

Learning activities and teaching methods:

Lectures 30 h, group work 50 h and self-study 50 h.

Target group:

Bachelor students in Process and Environmental Engineering

Prerequisites and co-requisites:

Objectives of 477202A Reactor analysis and 477304A Separation processes

Recommended optional programme components:

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Recommended or required reading:

Lecture handouts, Seider, W.D., Seader, J.D. and Lewin, D.R. Product and process design principles: Synthesis, analysis and evaluation. John Wiley & Sons, 2004. (Parts) ISBN 0-471-21663-1

Assessment methods and criteria:

Combination of a final exam or two midterm exams and group design exercises.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

Scale 0-5

Person responsible:

Dr Jani Kangas

Working life cooperation:

-

Other information:

-

477309S: Process and Environmental Catalysis, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Satu Pitkäaho
Opintokohteen kielet: English
Leikkaavuudet:

470226S	Catalytic Processes	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester, during 1 st period. It is recommended to complete the course at the fourth (1 st Master's) autumn semester.

Learning outcomes:

Student is capable of specifying the process steps in catalyst design, selection and testing. Student is able to explain the most important industrial catalytic processes, the use of catalysts in environmental technology, catalyst research and the significance of an interdisciplinary approach in the preparation, development and use of catalysts. He/she recognizes the connection between catalysis and green chemistry and the role of catalysis in sustainable processes and energy production.

Contents:

Catalyst and catalysis, sustainability. Catalysis in industry. Environmental catalysis.

Mode of delivery:

Lectures including design exercises, face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h, exercises 10 h, homework 20 h, teamwork presentations 10 h, and self-study 53 h.

Target group:

Master's degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

488212A Katalyysin perusteet tai 488309A Biokatalyysi

Recommended optional programme components:

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Recommended or required reading:

Lecture handout; Richardson, J.T.: Principles of Catalyst Development. New York. 1989, 288 pp.; Janssen, F.J.J.G. & van Santen, R.A.: Environmental Catalysis. NIOK, Catalytic Science Series, Vol. 1. 1999. 369 pp. *Additional literature:*Ertl, G., Knözinger, J. & Weitkamp, J.: Handbook of Heterogeneous Catalysis. Vol. 1-5. Weinheim. 1997, 657 p.; Thomas, J.M. & Thomas, W.J.: Principles and Practice of Heterogenous Catalysis. Weinheim 1997. 657 pp.; Somorjai, G.A.: Surface Chemistry and Catalysis. New York 1994, 667 pp.; van Santen, R.A., van Leuwen, P.W.N.M., Mouljin, J.A. & Averill, B.A.: Catalysis: An Integrated Approach, 2nd ed. Studies in Surface Science and Catalysis 123. Amsterdam 1999, Elsevier Sci. B.V. 582 pp.

Assessment methods and criteria:

Written examination and homework.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Satu Pitkäaho and Esa Turpeinen

Working life cooperation:

No

Other information:

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477204S: Chemical Engineering Thermodynamics, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jani Kangas
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS /135 hours of work

Language of instruction:

Finnish

Timing:

Period 1 (autumn term)

Learning outcomes:

By completing the course the student understands classical thermodynamics from a chemical engineering viewpoint. Especially she/he can explain the pVT behaviour of pure substances and understands the thermodynamic properties of mixtures. The student can classify the thermodynamic models describing, for example, liquid mixtures or electrolytes. The student can select appropriate models for gas, vapour and liquid phases. In addition, the student can solve process models, phase equilibrium and chemical reaction equilibrium problems, and more generally, is able to evaluate chemical processes using thermodynamic analysis tools.

Contents:

Mass and energy balances, pVT behaviour of pure substances, thermodynamic properties of fluids, thermodynamics of electrolytes, chemical reaction equilibrium, vapour/liquid equilibrium, calculation of thermodynamical state functions, thermodynamic analysis of processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 46 h and self-study 87 h

Target group:

Students in the study options Process Design and Chemical Engineering

Prerequisites and co-requisites:

Essential contents of 477401A Thermodynamic equilibria course, or equivalent knowledge on the basic concepts of thermodynamic equilibria.

Recommended or required reading:

Lecture handout. Material given during the lectures. Additional literature, Smith, J.M. & Van Ness, H.C. Introduction to Chemical Engineering Thermodynamics. McGraw-Hill, 1987.

Assessment methods and criteria:

Combination of examinations and exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr Jani Kangas

Working life cooperation:

No

Other information:

-

Process Engineering B

477123S: Chemical processing of biomasses, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: English

Leikkaavuudet:

477104S	Chemical Processing of Biomasses	3.0 op

ECTS Credits:

5 ECTS /133 h of work

Language of instruction:

English

Timing:

Implementation in autumn period 1

Learning outcomes:

Upon completion of the course, a student should be able to explain the value chain of chemical processing of renewable lignocellulosic raw materials to pulp and different end-products. A student is able to identify lignocellulosic raw material sources, their properties, their main components and utilization potential of components. The student also identifies the unit operations of chemical pulping processes, can explain their operational principles and their objectives in the process and their role in end product properties. Besides cellulose fibre production, the student identifies biorefining concepts of chemical pulp components (cellulose, hemicelluloses, lignin and extractives) into high value products; cellulose derivatives, special fibres, nanofibrillar and micronized celluloses, and green chemicals.

Contents:

Lignocellulosic raw materials, fundamentals of chemical pulping, recovering of chemicals in kraft pulping, bleaching of pulp. High value biomass products by biorefining (e.g. nanocelluloses and soluble celluloses).

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

The implementation methods of the course vary. Lectures and exercises max. 36 h, web learning and self-study 97 h. A part of the teaching can be replaced by group work or home work.

Target group:

Students interested in bioeconomy.

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended.

Recommended optional programme components:

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Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, book 6: Chemical pulping Part 1 and Part 2, book 20: Biorefining of Forest Resources. Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

This course utilizes continuous assessment including intermediate exam with web learning and homework. Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

A visit/excursion to the local pulp mill and/or visiting lecturers from the industry, when feasible.

Other information:

-

477124S: Mechanical processing of biomasses, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: English

Leikkaavuudet:

477105S	Mechanical Processing of Biomasses	3.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

English

Timing:

Implementation in autumn period 2

Learning outcomes:

Upon completion of the course, a student should be able to explain the value chain of mechanical and chemimechmical processing of renewable lignocellulosic raw materials. Upon completion of the course, a student should be able to identify the unit operations of mechanical and chemi-mechanical pulping process and can explain their operational principles. The student can evaluate the raw material properties and importance of different unit processes on the quality of the end products. In addition, the student can compare fibre properties of different mechanical and chemi-mechanical pulps and wood powders and can explain their effects on the quality of the end product. Student can explain production principle of engineered wood, biocomposites and pelletizing.

Contents:

Processing of wood, mechanical fibres, wood powders: raw material properties, mechanical and chemimechanical defibering, screening, bleaching, biomass micronization and pulverization, the production of engineered wood, wood-plastic composites and pellets. End product properties.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

The implementation methods of the course vary. Lectures and exercises max. 34 h, web learning and self-study 99 h. A part of the teaching can be replaced by group work or home work.

Target group:

Students interested in bioeconomy

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended

Recommended optional programme components:

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Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, book 5: Mechanical Pulping. Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

This course utilizes continuous assessment including intermediate exam(s) with potential web learning and homework. Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

Visiting lecturers from the industry and/or a visit/excursion to a local manufacturing site, when feasible.

Other information:

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477126S: Manufacturing of fibre products, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477107S	Paper Manufacture	3.0 op
477106S	Recycled Fiber Processes	3.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish.

Timing:

Implementation in spring period 4

Learning outcomes:

Upon completion of the course, a student should be able to identify the unit operations paper and board manufacturing and can explain their purpose of use. The student can name the most important chemicals, fillers and coating pigments and can explain their importance in paper and board making. The student can present the essential properties of papermaking fibres, the structure and properties of paper and board, as well as different paper and board grades. The student knows the fundamentals of printing technology and identifies paper properties essential for printing.

Contents:

Properties of fibers, web forming, chemicals in paper manufacture, coating process, structure and properties of paper, paper processing, paper grades, and fundamentals of printing technology.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (in Finnish) 42 h, a written case study as group work, which is presented to course participants, 40 h. Excursion to local paper mill and printing laboratory 3 h. Self-study 48 h.

Target group:

Students interested in bioeconomy.

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended.

Recommended optional programme components:

-

Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, books 8-11, and 13. Lecture materials and other materials that will be announced at the lectures. Separate study material for the English book exam for foreign students.

Assessment methods and criteria:

Examination and other evaluation methods.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

Lecturer from the industry.

Other information:

-

477128S: Circular Bioeconomy, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: English

Leikkaavuudet:

ay477128S	Circular Bioeconomy (OPEN UNI)	5.0 op
477125S	Recycling of bioproducts	5.0 op
477106S	Recycled Fiber Processes	3.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in the spring period 3.

Learning outcomes:

Upon completion of the course, a student should be able to recognize the incentives for the recycling of bioproducts and residues from forest industry. Student is familiarized with circular bioeconomy at the state-of-art level. Student is able to identify the challenges (properties, transportation ect.) of raw materials and their processing, can propose solutions and has ability to review the sustainability of final products.

Contents:

Reuse, recycling and utilization of bioproducts and side streams of forest industry in accordance with principles of circular bioeconomy. The properties and processing of raw material. Novel applications in circular bioeconomy.

Mode of delivery:

Lectures, group meetings and project work.

Learning activities and teaching methods:

Work load in the course is totally 133h. The number of lectures can vary but project working is main activities in the course.

Target group:

Students interested in circular bioeconomy.

Prerequisites and co-requisites:

488052A Introduction to Bioproduct and Bioprocess Engineering is recommended.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

The assignment and seminar. More information about assessment methods is given during the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

Visiting lecturers from the industry, when feasible.

Other information:

This Course replace course 477125S Recycling of bioproducts, 5 cr.

Autumation engineering

477621A: Control System Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hiltunen, Jukka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

477602A	Control System Analysis	4.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 1 (autumn term)

Learning outcomes:

After completing the course the student can describe the process dynamics with mathematical and graphical methods. The student can independently: form linear process models, analyse linear system stability, Bode diagrams, Routh’s stability criterion and the Jury's test, and evaluate the behavior of processes through time and frequency range specifications.

Contents:

Introduction to Matlab. Laplace-transforms. Transfer functions and block diagrams. Dynamical systems. Time and frequency analysis. System stability.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to process and environmental engineering I, 488010P Introduction to process and environmental engineering II, and 477051A Automation engineering recommended beforehand

Recommended optional programme components:

None

Recommended or required reading:

Materials delivered at the lectures and exercises. Dorf, R. (2010) Modern Control System. 12th ed. Prentice-Hall. 1104 pp. Additional literature: Ogata, K. (2002) Modern Control Engineering. 4th ed. Prentice-Hall. 964 pp., DiStefano, J. (1990) Feedback and Control Systems. 2nd ed. Prentice-Hall. 512 pp.; Ylen; J-P. (1994) Säätötekniikan harjoitustehtäviä. Hakapaino Oy. 252 pp.

Assessment methods and criteria:

Exam and in addition extra points from homeworks

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Lecturer Jukka Hiltunen and university teacher Seppo Honkanen

Working life cooperation:

No

Other information:

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477622A: Control System Design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ikonen, Mika Enso-Veitikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

477603A	Control System Design	4.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 3 (spring term)

Learning outcomes:

After completing the course the students can apply mathematical and graphical methods to the dynamics of process characterisation and control design. The student can form PID controllers for the process, and tune them and evaluate the closed-loop requirements.

Contents:

Laplace-level vs, time level, poles of the system, closed loop and its design specifications, PID control and tuning, Matlab control designer tool, control design in frequency domain

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to process and environmental engineering I, 488010P Introduction to process and environmental engineering and 477602A Control system analysis recommended beforehand

Recommended optional programme components:

None

Recommended or required reading:

Lecture and exercise handouts. Åström, K & Murray, R. (2009) Feedback Systems, An Introduction for Scientists and Engineers. Princeton University Press, New Jersey, 396 s. Additional literature: Dorf, R (2010) Modern Control Systems. Prentice-Hall, New York, 1104 s., DiStefano, J (1990) Schaum's Outline of Feedback and Control Systems. 2nd ed, McGraw-Hill, 512 s. ja Ylen, J-P (1994) Säätötekniikan harjoitustehtäviä. Hakapaino Oy, 252 s.

Assessment methods and criteria:

Exam

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Professor Enso Ikonen and university teacher Seppo Honkanen

Working life cooperation:

No

Other information:

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477524S: Process Optimization, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477524S Process Optimization (OPEN UNI) 5.0 op

477504S Process Optimization 4.0 op

ECTS Credits:

5 ECTS /135 hours of work

Language of instruction:

English

Timing:

Spring semester, the 3th period. Recommended for 1st year M.Sc. students.

Learning outcomes:

Student can use and apply standard unconstrained and constrained optimization methods. Student can define and identify optimization problems. Student is able to summarize the role of optimization in process engineering.

Contents:

Basic concepts of optimization. Optimization of unconstrained and constrained functions. Linear programming. Trajectory optimization. Hierarchical optimization. Intelligent methods in optimization. Applications in process engineering.

Mode of delivery:

Face-to-face teaching and exercises.

Learning activities and teaching methods:

The amount of guided teaching is 40 hrs. Contact teaching includes, depending on situation, lectures, group work and tutored group work. During self-study time student does independent or group work.

Target group:

M.Sc. students of process and environmental engineering and M.Sc. students interested in process optimization. Exchange and other international students.

Prerequisites and co-requisites:

No prerequisites but basic understanding on numerical methods and process modelling are useful.

Recommended optional programme components:

See prerequisites

Recommended or required reading:

Reading materials. Ray, W.H. & Szekely, J. (1973) Process Optimization with Applications in Metallurgy and Chemical Engineering. John Wiley & Sons.

Assessment methods and criteria:

This course uses continuous assessment that includes solved exercises and lecture exams. Final exam is also possible.

Grading:

The course unit uses a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Aki Sorsa

Working life cooperation:

No

Other information:

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477624S: Control System Methods, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: István Selek

Opintokohteen kielet: Finnish

Leikkaavuudet:

477614S	Control System Methods	3.0 op
477605S	Digital Control Theory	4.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 1 (autumn term)

Learning outcomes:

After completing the course students can identify the problems of the sampled data systems, and know how to apply discrete time methods for systems analysis and control design.

Contents:

1. Control systems design by frequency-response methods. 2. Control systems design in state space methods 3. Sampled data systems: sampling, Z transformation of signals. 4. Discrete-time modelling: difference equation, shift operator, pulse transfer function, polynomial and state-space description. 5. Analysis of discrete-time systems: z-plane, stability. 6. Discrete-time control design strategies: general RST structure, various pole-zero placement control algorithms, minimum-variance control, model-based control, state-space design methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises include guided computer simulations

Target group:

M.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477621A Control system analysis and 477622A Control system design recommended beforehand

Recommended optional programme components:

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Recommended or required reading:

Lecture handout. Dorf, R. (2010) Modern Control Systems. Prentice-Hall, New York, 1104 s, Ogata, K (2002) Modern Control Engineering. Prentice-Hall, New York, 964 s., Åström, K & Murray, R. (2009) Feedback Systems, An Introduction for Scientists and Engineers. Princeton University Press, New Jersey, 396 s., Landau, I. & Zito, G. (2005) Digital Control Systems, Springer. 485 pp. Åström, K.J. & Wittenmark, B. (1984, 1997) Computer Controlled Systems: Theory and Design. Prentice-Hall International. 544 pp.

Assessment methods and criteria:

Final written exam; to request an exam in English, contact the lecturer via email beforehand.

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

University teacher Seppo Honkanen

Working life cooperation:

No

Other information:

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555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440263: Complementary Module, Civil Engineering, 20 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Structural Engineering

485109A: Numerical methods in structural engineering, 5 op

Voimassaolo: 01.08.2019 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Civil Engineering field
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

485121S	Numerical methods in structural engineering	5.0 op
466103A	Project work in structural engineering	5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Spring semester, periods 3-4

Learning outcomes:

Ability to develop relevant structural designs and calculations using modern computational tools. Ability to present the results of the design both orally and in writing. Knowledge of the properties of different structural models from the viewpoint of structural dimensioning. Understanding of the fundamentals of yield line theory. Ability to determine the plastic limit load of a slab using the yield line theory. Knowledge of the special features of curved shell structures and their implications for structural design.

Contents:

Structural models. Loading. Plates and slabs. Membrane theory of shells. Theory of shell edge effects. Stability.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures, excercises and self study

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction, 466102A Introduction to structural design, 461107A Finite Element Methods I, 461108A Mechanics of materials

Recommended or required reading:

The course material will be distributed during the lectures.

Assessment methods and criteria:

Homework and exercises

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Senior research fellow Antti Niemi

Other information:

This course replaces course 466103A Project work in structural engineering in Academic year 2019-20.

466107S: Design of concrete structures, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Niemi

Opintokohteen kielet: Finnish

Leikkaavuudet:

485106A	Design of concrete structures	5.0 op
460147A	Introduction to Design of Concrete Technology	4.0 op
460147A-01	Introduction to Design of Concrete Technology, examination	0.0 op
460147A-02	Introduction to Design of Concrete Technology, exercise work	0.0 op
460148S	Design of Concrete Structures	4.0 op
460148S-01	Design of Concrete Structures I, examination	0.0 op
460148S-02	Design of Concrete Structures I, exercises	0.0 op

ECTS Credits:

6 ECTS /162 hours

Language of instruction:

Finnish

Timing:

Lectures and exercising on periods 3 and 4.
Course 485106A replaces this course in academic year 2020-2021.

Learning outcomes:

Upon completion of the course, the student will be able to design typical reinforced concrete structures to EN-standards.

Contents:

Strength and strain properties of concrete and reinforcing bars, time dependent properties. Limit state design of concrete beams and columns to EN standards. Service life design. Fire design. Anchoring and joints of reinforcing bars. Design of flanged cross sections, walls and wall like beams, and foundations carrying walls and columns.

Mode of delivery:

face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercising 54 hours including personal and team work. Self-reliant studying and homework 108 hours.

Target group:

Master level students focusing on structural engineering and design.

Prerequisites and co-requisites:

Recommended good skills in: Statics, strength of materials, structural mechanics of beam and plated structures. Basics in concrete technology and structural design.

Recommended or required reading:

Nykyri: BY211 Betonirakenteiden suunnittelun oppikirja, osa 1, 2013 ja osa 2, 2015; Leskelä: By210 Betonirakenteiden suunnittelu ja mitoitus 2008; By60 Suunnitteluohje EC2 osat 1-1 ja 1-2, 2008; EN 1992-1-1, EN 1992-1-2 (ja muut EN-standardit tarvittavilta osin); BY51 Betonirakenteiden käyttöikäsuunnittelu 2007; BY47 Betonirakentamisen laatuohjeet 2007; RIL 229-2-2006 Rakennesuunnittelun asiakirjaohje, Mallipiirustukset ja -laskelmat; By47 Betonirakentamisen laatuohjeet 2007; RIL202-2012 Betonirakenteiden suunnitteluohje. Martin, Purkiss: Concrete design to EN 1992, Elsevier, 2nd ed. 2006. Lecture and exercise materials.

Assessment methods and criteria:

Continuous assessment. The course can be completed by participating in intermediate exams during the course, or in final exam. Assessment criteria are based on the learning outcomes of the course.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Antti Niemi

Other information:

This course will replace course 485106A in Academic year 2020-21.

485108A: Desing of Steel Structures and Steel Construction, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 ects

Language of instruction:

Finnish

Timing:

Periods 1 and 2

Learning outcomes:

After completing the course the student is capable of explaining the crystalline structure of steel material and he understands elasto-plastic material model. He is able to explain the effect of inclusions, heat treatment and welding process to the mechanical properties of a steel material. The student is familiar with fire design of steel structures. He is able to explain common types of corrosion. The student is able to design the most typical joints in a steel frame and he can analyze simple steel structures. He is also able to analyze stability problems and explain the effects of imperfections and second order effects on frame behavior and member forces.

Contents:

The following topics are covered during the course: Ferrous metals and their properties. Principles of Eurocodes. Design of simple steel structure under base loading cases and loading combinations. Corrosion. Design of joints in steel structures. Composite structures with steel member. Section classification. Effective cross-section. Cross-sections with stiffeners. Steel members in bending and axial compression. Buckling, lateral torsional buckling, and torsion.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures, exercises and self-study.

Target group:

Major students in Structural Engineering and Construction Technology, Mashine design, and Engineering Mechancs.

Prerequisites and co-requisites:

466102A Introduction to Structural Design. Key notes in courses Statics, Strength of Materials I, Strength of Materials II, Energy principles and Their Use in Beam Structures, and Plates and Shells and Mechanics of materials

Recommended or required reading:

Lecture notes (in Finnish). Eurocodes 1990-1999.

Assessment methods and criteria:

Three midterm exams or one final exam is required. One design exercise is required.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Matti Kangaspuoskari

Other information:

This course will replace course 466105S Design of Steel Structures in Academic year 2020-21.

485107A: Timber construction and product technology, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

This is new course, which will teach first time in Academic Year 2020-21.

Traffic and road construction engineering

485401A: Basics of Traffic Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

488151A	Basics of Traffic Engineering	5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 1

Learning outcomes:

By completing the course the student knows the basics of modes of transport, the significance of traffic and transportation to society, traffic planning and research methods, transport economics and the external effects of transport.

Contents:

Modes of transport, Need for traffic and transportation, Transport planning and research, Economical and environmental impacts of traffic, Traffic safety.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the Master's Programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

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Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

This course will replace course 488151A Basics of Traffic Engineering in Academic year 2019-20.

485402S: Advanced Course in Traffic Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

488152S	Advanced Course in Traffic Engineering	5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 2

Learning outcomes:

By completing the course the student understands the basics of transport policy and the significance of transport economics to society. The student becomes familiar with traffic safety and is able to analyse the problems of traffic safety and opportunity to improve it.

Contents:

Transport policy, transport economics, traffic safety

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the master’s programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488151A Basics of Traffic Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

This course will replace course 488152S Advanced Course in Traffic Engineering in Academic year 2019-20.

485403A: Basics of Road Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail
Opettajat: Veikko Pekkala
Opintokohteen kielet: Finnish
Leikkaavuudet:

488153A	Basics of Road Engineering	5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 3

Learning outcomes:

By completing the course the student understands the basics of road design and construction, is able to calculate structure layers of road and is familiar with the maintenance of roads

Contents:

Road and street planning and design, lining, roads structure, maintenance of roads, basics of earthworks

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

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Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Materials delivered during the lectures

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Veikko Pekkala

Other information:

This course will replace course 488153A Basics of Road Engineering in Academic year 2019-20.

485404S: Road Design and Construction, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Civil Engineering field
Arvostelu: 1 - 5, pass, fail
Opettajat: Veikko Pekkala
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Period 4

Learning outcomes:

By completing the course the student is familiar with road structure and function, structural modernisation, pavements and the basics of earthworks. He/she is also able to design road computer aided.

Contents:

Function of road structure, road damaging, structural modernisation, pavements, Road design and construction

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 32 h, self-study 75 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488153A Road Design and Construction, and 488051A AutoCAD and Matlab in process and environmental engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Veikko Pekkala

Other information:

This course will replace course 488154S Road Design and Construction in Academic year 2019-20.

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A440256: Supplementary Module, Environmental Engineering, 20 - 30 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Supplementary Module

Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Enviromental Engineering A

488209S: Renewable Energy, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Huuhtanen, Mika Ensio
Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 135 hours of work.

Language of instruction:

English

Learning outcomes:

The student is able to define different methods and techniques to generate electricity and heat. He/she is able to explain steam power plant operating principles and is able to compare operation of different kinds of steam power plants. The student can describe the environmental impacts of energy production and is able to compare the environmental impacts of different ways of producing energy. The student is able to identify functioning of the fossil based and renewable energy production systems. He/she is able to explain how the electricity markets work. The student is also able to explain the adequacy of energy reserves.

Contents:

Structure of energy production and consumption. Systems for electric transportation, storing and distribution. Distribution and adequacy of energy resources. Effects of environment contracts on the use of energy resources. Environmental comparison of different energy production methods and fuels. Energy markets. Development views of energy technology.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40h, self-study 95 h

Target group:

Master's degree students of Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

The courses 477011P and 488010P Introduction to Process and Environmental Engineering I and II or 477013P Introduction to Process and Environmental Engineering are recommended.

Recommended optional programme components:

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Recommended or required reading:

Materials delivered via the Optima environment.

Assessment methods and criteria:

Written final exam.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Mika Huuhtanen

Working life cooperation:

No

Other information:

This course replaces the course 488202S Production and Use of Energy in academic year 2019-2020.

488501S: Smart Grid I: Integrating renewable energy sources, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eva Pongracz

Opintokohteen kielet: English

ECTS Credits:

5 cr/150 hours of work

Language of instruction:

English

Timing:

Period 2

Learning outcomes:

The student is able to explain the concept of smart grids, the evolution of smart grids from electricity power grids, the information technology requirements as well as the economic, environmental and social implications of smart grids. The student can explain the basic functioning of energy markets in Finland and the Nordic countries as well as the basics of electricity and carbon pricing. The student is also able to find real time data on variable energy sources (VRES) and able to apply the residual curve equation. The student can also explain the costs of large scale VRES integration and how they can be mitigated. The student can also explain demand site flexibility and the need for flexibility services emerging in the smart grid system. The student will know the expectations from smart grids and is able to outline the future perspectives of smart grid-based energy systems. The student is able to draft a scenario for the decarbonization of the energy system by 2050, and assess its economic, environmental and geopolitical implications, as well as the technological and infrastructural gaps.

Contents:

Multidisciplinary course, offered at the Faculty of Technology (Water, Energy and Environmental Engineering research group – WE3), in cooperation with Oulu Business School (OBS, Department of Economics) and the Faculty of Information Technology and Electrical Engineering (Centre of Wireless Communication - CWC).

After an introductory presentation on the requirements, the background is set on the energy and environmental crisis, the co-evolution of energy and information systems and outlining the transition to a smarter system. Further, lectures on smart grids will be provided from an electrical engineering and information technology view on the evolution of electricity power grids, power generation transmission and distribution; distributed generation and futures of smart grids. From an environmental engineering point of view, lectures will be delivered on energy systems fundamentals, climate goals and decarbonization, as well as on the sustainability of smart grids will in particular the environmental and social impacts of smart grids. From economics points of view, lectures will be given on the liberalization and deregulation of the electricity market, electricity pricing, transmission and distribution as natural monopolies, smart grids and new market mechanisms, and the economic impacts of large-scale integration of renewable energy sources. Participation on lectures is not compulsory, but students are to answer to problem questions.

As an exercise, students will be given a group work assignment that they are to work with throughout the duration of the course with the help of mentors. The subjects of the exercise is achieving climate goals and the future of energy systems.

Mode of delivery:

Implemented as face-to-face teaching and student seminar. The course largely relies on participatory learning, therefore, there are compulsory participation requirements.

Learning activities and teaching methods:

Lectures 32 h / student presentations 8 h, Guided group work: 8 h, individual homework 50 h/group work 37 h.

Target group:

Master's students of environmental engineering, especially of energy and environmental engineering orientation; Master's students in economics; Master's students of Electrical Engineering and Information Technology.

Prerequisites and co-requisites:

For Environmental Engineering students, admission to the Master's programme, for which minimally a former bachelor's degree is required. For other students the Bachelor level studies. A minimum of 10 ECTS worth of prior energy studies, bachelor level studies are acceptable. For example at Oulu: 488202S Production and use of energy, 488504S Fundamentals of nuclear energy.

Recommended or required reading:

Will be provided during the course by the lecturers.
Chen-Ching Liu, Stephern McArthur and Seung-Jae Lee (eds.)(2016) Smart Grids handbook, 3 volume set, and Stephen F. Bush (2014): Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. http://onlinelibrary.wiley.com/book/10.1002/9781118820216.

Assessment methods and criteria:

Answering problem questions and group exercise. Compulsory requirements are completing learning portfolio, answering of at least 75% of problem questions, participation in 50% of intermediate presentations and compulsory participation in the final presentation.

Grading:

The course evaluation will be based on an on-line learning portfolio and performance in the exercise participation and exercise report. The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.

Person responsible:

Docent Eva Pongrácz (EEE) and Prof. Maria Kopsakangas-Savolainen (OBS). Other lecturers: EEE: Dr. Antonio Caló, Dr. Jean-Nicolas Louis; OBS: Prof. Rauli Svento, M.Sc. Mari Heikkinen, M.Sc. Hannu Huuki, M.Sc. Santtu Karhinen, M.Sc. Enni Ruokamo; CWC: Dr. Sc. Jussi Haapola.

Other information:

The number of students is limited. This course is a 5 credit course for engineering students, but economics students gain overall 6 credits by doing a mandatory extra assignment which corresponds to 1 credit.

488502S: Smart Grid II: Smart buildings/smart customers in the smart grid, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eva Pongracz

Opintokohteen kielet: English

ECTS Credits:

5 cr/137 hours of work

Language of instruction:

English

Timing:

Period 3

Learning outcomes:

The student is able to explain the concept of smart houses, and is able to demonstrate the optimization of smart house functions for energy efficiency, decarbonization and cost savings. Further, the student is familiar with the concepts and the technologies of smart house automation as well as other technologies used in smart houses such as smart appliances, smart metering and energy storage. The student will also understand the new role of consumers in the smart grid environment, their changing roles as well as current and future models of energy services. The student will also understand the risks of smart houses in terms of cyber security, data privacy and management. In addition, the student is able to outline the future perspectives of smart houses and smart consumers as part of the smart city framework and aiming toward eco-cities of the future.

Contents:

Multidisciplinary course, offered in cooperation of the Faculty of Technology (Energy and Environmental Engineering Research Unit - EEE), Oulu Business School (OBS, Department of Economics) and the Faculty of Information Technology and Electrical Engineering (Centre of Wireless Communication - CWC). After an introductory presentation on the course requirements, the basics are set in terms of defining smart houses as part of smart grids. Further the complementary roles of smart houses for energy efficiency, costs saving and decarbonization is explained. The key technologies of smart houses will be explained and demonstrated, including company presentations on existing commercial technologies and service models. In addition, the new role of consumers as prosumers and service users will be explained and demonstrated. There will be no exam, however, the students are to answer to problem questions related to the lectures and complete the exercises. There will be 4 exercises, concentrating on the 4 key themes of the course: smart house functions, smart house technologies, smart consumers, and energy services. Part of the exercises will be done as individual work that will be reported and some will be performed as group work. There will also be in-class guided exercises.

Mode of delivery:

Implemented as face-to-face teaching, visiting lectures and student presentations. The course largely relies on participatory learning, therefore, there are compulsory participation requirements.

Learning activities and teaching methods:

Lectures 28 h, student presentations 4 h, guided exercise work 24 h, individual work 45 h, group work 34 h.

Target group:

Master's students of environmental engineering, especially of energy systems orientation; Master's students in economics; Master's students of Electrical Engineering and Information Technology. Doctoral students are also welcome to participate.

Prerequisites and co-requisites:

Completing course 488501S is preferred.

Recommended or required reading:

Will be provided during the course by the lecturers.
Chen-Ching Liu, Stephern McArthur and Seung-Jae Lee (eds.)(2016) Smart Grids handbook, 3 volume set, and Stephen F. Bush (2014): Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. http://onlinelibrary.wiley.com/book/10.1002/9781118820216.

Assessment methods and criteria:

Answering problem questions, individual and group exercise. Compulsory requirements are completing learning portfolio, answering of at least 75% of problem questions, compulsory participation in the in-course exercises and participation in the student presentation.

Grading:

The course evaluation will be based on an on-line learning portfolio, exercise performance and exercise report. The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.

Person responsible:

Prof. Eva Pongrácz (EEE) and Prof. Maria Kopsakangas-Savolainen (OBS). Other lecturers: EEE: Dr. Jean-Nicolas Louis; Dr. Antonio Caló, OBS: MSc Enni Ruokamo and MSc Santtu Karhinen.; CWC: Doc. Jussi Haapola.

Other information:

The number of students is limited. This course is a 5 credit course for engineering students, but economics students gain overall 6 credits by doing a mandatory extra assignment which corresponds to 1 credit.

488503S: Smart Grid III: Smart energy networks, 5 op

Voimassaolo: 28.11.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Eva Pongracz
Opintokohteen kielet: English

ECTS Credits:

5 cr/150 hours of work

Language of instruction:

English

Timing:

During period 4 in spring semester

Learning outcomes:

The student is able to explain the concept of energy transition, and is able to outline the structure and functioning of smart energy networks. Further, the student is familiar with the concepts of multiple energy networks, integrating multiple energy networks and networks flow analysis. The student will also understand the concept of swarms of distributed energy generation and the need for storage to ensure network stability. The student will also able to outline the key energy storage methods and will be able to recommend them for distributed vs. centralized storage of both heat and electricity, for long term as well as short term. The student will also be able to use design tools for the planning and evaluation of future energy systems. The student will also be able to assess the dimensions of sustainability of smart energy networks.

Contents:

Multidisciplinary course, offered in cooperation of the Faculty of Technology (Energy and Environmental Engineering Research Unit - EEE), Oulu Business School (OBS, Department of Economics) and the Faculty of Information Technology and Electrical Engineering (Centre of Wireless Communication - CWC). After an introductory presentation on the course requirements, the basics are set in terms of defining energy transition to a carbon neutral energy future. Further the integration of multiple energy networks will be explained, as well as communication within multiple energy networks. The issue of swarms of distributed generation will be explained, as well as the economics of a system relying largely on renewables. The key storage technologies will be explained, demonstrating their use for heat or electricity storage, their effectiveness on small or large scale, as well as their purpose and economics of short and long term storage. Communication within the smart grid as well the economics of distributed generation in a future carbon neutral energy system will be explained. Finally, the sustainability assessment of smart energy network performance will be explained. There will be no exam, however, the students will need to answer to problem questions related to the lectures and complete exercises. There will be 3 exercises, concentrating on (1) evaluation of storage technologies, (2) simulation of future smart energy networks and (3) sustainability assessment. The simulation work will be done as group work using the EnergyPlan freeware, for which in-class guidance will be provided. The results of the simulation will have to be presented. The rest will be done as individual work.

Mode of delivery:

Implemented as face-to-face teaching, visiting lectures and student presentations. The course largely relies on participatory learning, therefore, there are compulsory participation requirements.

Learning activities and teaching methods:

Lectures 28 h, student presentations 4 h, guided exercise work 24 h, individual work 50 h, group work 38 h.

Target group:

Master’s students of environmental engineering, especially of energy and environmental engineering orientation; Master’s students in economics; Master’s students of Electrical Engineering and Information Technology. Doctoral students are also welcome to participate.

Prerequisites and co-requisites:

Completing Smart grids 1 is a prerequisite, completing Smart grids 2 prior to this course is also recommended.

Recommended or required reading:

Will be provided during the course by the lecturers.
Chen-Ching Liu, Stephern McArthur and Seung-Jae Lee (eds.)(2016) Smart Grids handbook, 3 volume set, and Stephen F. Bush (2014): Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. http://onlinelibrary.wiley.com/book/10.1002/9781118820216.

Assessment methods and criteria:

Answering problem questions, individual and group exercise. Compulsory requirements are completing learning portfolio, answering of at least 75% of problem questions, compulsory participation in the in-course exercises and participation in the student presentation.

Grading:

The course evaluation will be based on an on-line learning portfolio, exercise performance and exercise report. The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.

Person responsible:

Prof. Eva Pongrácz (EEE) and Prof. Maria Kopsakangas-Savolainen (OBS). Other lecturers: EEE: Dr. Antonio Caló, Dr. Jean-Nicolas Louis; OBS: Enni Ruokamo; CWC: Dr. Jussi Haapola, MSc. Florian Kühlenz

Other information:

The number of students is limited. This course is a 5 credit course for engineering students, but economics students gain overall 6 credits by doing a mandatory extra assignment which corresponds to 1 credit.

Enviromental engineering B

477309S: Process and Environmental Catalysis, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Pitkäaho

Opintokohteen kielet: English

Leikkaavuudet:

470226S	Catalytic Processes	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester, during 1 st period. It is recommended to complete the course at the fourth (1 st Master's) autumn semester.

Learning outcomes:

Student is capable of specifying the process steps in catalyst design, selection and testing. Student is able to explain the most important industrial catalytic processes, the use of catalysts in environmental technology, catalyst research and the significance of an interdisciplinary approach in the preparation, development and use of catalysts. He/she recognizes the connection between catalysis and green chemistry and the role of catalysis in sustainable processes and energy production.

Contents:

Catalyst and catalysis, sustainability. Catalysis in industry. Environmental catalysis.

Mode of delivery:

Lectures including design exercises, face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h, exercises 10 h, homework 20 h, teamwork presentations 10 h, and self-study 53 h.

Target group:

Master's degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

488212A Katalyysin perusteet tai 488309A Biokatalyysi

Recommended optional programme components:

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Recommended or required reading:

Lecture handout; Richardson, J.T.: Principles of Catalyst Development. New York. 1989, 288 pp.; Janssen, F.J.J.G. & van Santen, R.A.: Environmental Catalysis. NIOK, Catalytic Science Series, Vol. 1. 1999. 369 pp. *Additional literature:*Ertl, G., Knözinger, J. & Weitkamp, J.: Handbook of Heterogeneous Catalysis. Vol. 1-5. Weinheim. 1997, 657 p.; Thomas, J.M. & Thomas, W.J.: Principles and Practice of Heterogenous Catalysis. Weinheim 1997. 657 pp.; Somorjai, G.A.: Surface Chemistry and Catalysis. New York 1994, 667 pp.; van Santen, R.A., van Leuwen, P.W.N.M., Mouljin, J.A. & Averill, B.A.: Catalysis: An Integrated Approach, 2nd ed. Studies in Surface Science and Catalysis 123. Amsterdam 1999, Elsevier Sci. B.V. 582 pp.

Assessment methods and criteria:

Written examination and homework.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Satu Pitkäaho and Esa Turpeinen

Working life cooperation:

No

Other information:

-

488203S: Industrial Ecology, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Väisänen, Virpi Maria

Opintokohteen kielet: English

Leikkaavuudet:

ay488203S	Industrial Ecology and Recycling	5.0 op
480370S	Industrial Ecology and Recycling	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester during 1 st period.

Learning outcomes:

Upon completion of the course, the student will be able to use the tools of industrial ecology and apply them to industrial activity. The student can also analyze the interaction of industrial, natural and socioeconomic systems and able to judiciously suggest changes to industrial practice in order to prevent negative impacts. The student can also analyze the examples of industrial symbioses and eco-industrial parks and able to specify the criteria of success for building eco-industrial parks.

Contents:

Material and energy flows in economic systems and their environmental impacts. Physical, biological and societal framework of industrial ecology. Industrial metabolism, corporate industrial ecology, eco-efficiency, dematerialization. Tools of industrial ecology, such as life-cycle assessment, design for the environment, green chemistry and engineering. Systems-level industrial ecology, industrial symbioses, eco-industrial parks.

Mode of delivery:

Face-to-face teaching in English.

Learning activities and teaching methods:

Lectures 30 h / Group work 30 h / Self-study 75 h. The exercises are completed as guided group work.

Target group:

Master's degree students of process and environmental engineering.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes; Graedel T.E & Allenby B.R.: Industrial Ecology. New Jersey: Prentice Hall, 2003.

Assessment methods and criteria:

All students complete the course in a final exam. Also the exercise will be assessed. The assessment criteria are based on the learning outcomes of the course.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virpi Väisänen

Working life cooperation:

No

Other information:

-

488214S: Air Pollution Control Engineering - Practical Solutions, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Satu Pitkäaho

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

English

Timing:

Implementation in autumn semester during 2 nd period first time in Autumn term 2021.

Learning outcomes:

Student is able to explain what kind of air emissions originate from different industrial and energy production sectors. Student deepens knowledge obtained in 488213A course and is able to apply it to different practical emission problems. She/he is able to comprehensively describe, choose, design and optimize emission control technologies. Student understands essential regulations and laws concerning emission control.

Contents:

Principles of air pollution control equipment and their use in real applications. Emission control case studies in industry and energy production sector. Air pollution related regulations and laws.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, exercises 12 h, homework 8 h, teamwork presentations 10 h, and self-study 75.

Target group:

Master's degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

488213A Ilmansuojelutekniikan perusteet

Recommended optional programme components:

-

Recommended or required reading:

Materials in the Optima environment. de Nevers; N.: Air Pollution Control Engineering. 2nd ed. McCraw-Hill 2000. 586 pp
Additional literature: Singh, H. B.: Composition, Chemistry, and Climate of the Atmosphere. New York 1995. 527 pp.; Bretschneider, B. & Kurfurst, J.: Air Pollution Control Technology. Elsevier, Amsterdam 1987. 296 pp.; Hester, R. E. & Harrison, R. M.: Volatile Organic Compound in the Atmosphere. Issues in Environmental Science and Technology. Vol. 4. Bath 1995; Hester, R. E. & Harrison, R. M.: Waste Incineration and the Environment. Issues in Environmental Science and Technology. Vol 4. Bath 1995.

Assessment methods and criteria:

Written final exam or intermediate exams.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi /english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Satu Pitkäaho ja Esa Turpeinen

Working life cooperation:

No.

Other information:

Korvaa lukuvuonna 2019-2020 kurssin 488204S Air Pollution Control Engineering.

488215S: Industry and Environment, 5 op

Voimassaolo: 28.06.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

477334S	Industrial activities and environment	5.0 op
ay488215S	Industry and Environment (OPEN UNI)	5.0 op
488221S	Environmental Load of Industry	5.0 op

488205S Environmental Load of Process Industry 4.0 op

ECTS Credits:

5 cr / 135 hours of work

Language of instruction:

English

Timing:

This course will teach first time in Autumn 2020. This course replaces course 488221S Environmental Load of Industry.

Learning outcomes:

The student is able to identify the essential features of the environmental load in different types of (chemical, wood, metallurgical,...) industry. He/she is able to explain the type, quality, quantity and sources of the emissions. The student is familiarized with the main emission control systems and techniques in different industrial sectors. The student can explain the environmental management system of an industrial plant and is able to apply it to an industrial plant.

Contents:

Effluents: types, quality, quantity, sources. Unit operations in managing effluents, comprehensive effluent treatment. Environmental management systems, environmental licences, environmental reporting and BAT.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h, self-study 93h.

Target group:

Master's degree students of the Process and Environmental Engineering study programmes.

Prerequisites and co-requisites:

The courses 477011P Introduction to Process and Environmental Engineering I, 488011P Introduction to Process and Environmental Engineering II, 488204S Air Pollution Control Engineering and 488110S Water and Wastewater Treatment recommended beforehand.

Recommended or required reading:

Material represented in lectures and in the Optima environment.

Assessment methods and criteria:

Written final exam or a learning diary.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:

Doctoral student Niina Koivikko

Working life cooperation:

No.

Other information:

The course mainly consists of specific lectures presented by experts who are invited from industry.

This course will teach as online course in Fitech in Spring Term 2020.

Environmental engineering C

488110S: Water and Wastewater Treatment, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480151S	Water and Wastewater Treatment	7.0 op
480208S	Industrial Water and Wastewater Treatment	3.5 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during period 1

Learning outcomes:

Upon completion of the course, the student will be able to understand the theory and practicalities behind the most used purification processes in water and wastewater treatment. The student will also be capable of performing basic dimensioning calculations and therefore he/she will be able to dimension structures/units of water and wastewater treatment plants and to comprehend the basic requirements of different purification processes.

Contents:

Water quality characteristics of source water; basic principles of purification processes (coagulation/flocculation, sedimentation, biological treatment, filtration, disinfection, etc); process units in water and waste water treatment; selection of process units; dimensioning of treatment structures and unit processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h), field visits (5 h), exercises and other assignments (60) and self-study (38 h).

Target group:

Students in Master program of Environmental Engineering and in master program of civil engineering.

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: Introduction to process and environmental engineering (477013P) or I (477011P) and II (488010P)

Recommended optional programme components:

-

Recommended or required reading:

To be provided during the course.

Assessment methods and criteria:

The course can be completed in two different study modes: A) Active mode: midterm exam based on reading material + completion of 2 group exercises + final exam based on lectures and exercises; B) Passive mode (book exam): 100% self-study mode where the student is provided with 2-3 reference books and attends an exam based on the provided material. (Passive mode can be complete under special circumstances)
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Post-doctoral researcher Dr Elisangela Heiderscheidt

Working life cooperation:

Through visits to water and wastewater treatment plants, which include lectures provided by environmental engineers in charge and guided tours, the students familiarize with the main technological and process related principles of the field and have the chance to experience in first hand how to deal with some of the most common issues related to water and wastewater purification systems.

Other information:

-

488134S: Hydrogeology and groundwater engineering, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the spring semester, during period 3

Learning outcomes:

Upon completion of the course, the student will have knowledge on groundwater systems and the basic hydrogeological and engineering concepts involved. This includes analysis of flow in porous media, hydraulics of groundwater systems, groundwater quality and groundwater use. After the course students are able to estimate key factors influencing on groundwater recharge, flow and discharge and to use general methods to calculate groundwater flow.

Contents:

2D and 3D groundwater flow, conceptual models, unsaturated layer flow, water storage and retention, heterogeneity and isotropy, aquifer types, pumping tests, geophysical methods, groundwater quality and resources in Finland

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures (18 h), calculus lectures (12 h), homework, exercises and self-study (103 h).

Target group:

Master students in the water engineering orientation of the Environmental Engineering program and in master program of civil engineering

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit: 488102A Hydrological Processes

Recommended or required reading:

Lecture handouts, Physical and Chemical Hydrogeology (Domenico PA, Schwartz FW, 2nd edition, 1998, ISBN 0-471- 59762-7). Maanalaiset vedet - pohjavesigeologi-an perusteet (Korkka-Niemi K, Salonen V-P, 1996, ISBN 951-29-0825-5). Pohjavesi ja pohjaveden ympäristö (Mälkki E, 1999, ISBN 951-26-4515-7).

Assessment methods and criteria:

exam and/or lecture exams.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Postdoctoral Researcher Pekka Rossi

Working life cooperation:

Students familiarize themselves to a real groundwater aquifer cases discussed in lectures and in the course exercise.

488135S: Water distribution and sewage networks, 5 op

Voimassaolo: 28.11.2016 - 31.07.2019

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: English

Leikkaavuudet:

488144A	Water distribution and sewage networks	5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, in period 2

Learning outcomes:

Student knows and understands the systems and dynamics needed for water distribution and waste water networks. Student is able to do basic dimensioning for water distribution network and sewer system of an urban area.

Contents:

Water distribution and waste water network design and dimensioning, Pumping and storage tanks needed in distribution of water and collection of sewage waters, renovation of pipelines, special circumstances in water distribution, effects of cold climate and harmful hydraulic conditions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h), homework (45 h) and a design exercise (58 h).

Target group:

Students in master program of environmental engineering and in master program of civil engineering

Prerequisites and co-requisites:

Use of AutoCAD-program

Recommended optional programme components:

The recommended prerequisite is the completion of the following course prior to enrolling for the course unit: 477052A Virtaustekniikka, 477312A Lämmön- ja aineensiirto 488102A Hydrological Processes and 488051A AutoCAD ja Matlab prosessi- ja ympäristötekniikan työkaluna or at least equivalent information about water management.

Recommended or required reading:

Lecture handout and other materials delivered in lectures. To the appropriate extent: RIL 237-1-2010 Vesihuoltoverkkojen suunnittelu, RIL 237-2-2010 Vesihuoltoverkkojen suunnittelu, RIL 124-2 Vesihuolto II, Mays Water distribution systems handbook

Assessment methods and criteria:

Exam and a design exercise.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Postdoctoral Researcher Pekka Rossi

Working life cooperation:

Visit to a site of water distribution network buiding site, pumping station or water supply/sewerage company.

488206S: Sustainable Energy Project, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Huuhtanen, Mika Ensio

Opintokohteen kielet: English

Leikkaavuudet:

488410A	Introduction to Sustainable Energy	10.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

English

Timing:

Implementation in spring semester during 3 th and 4 th periods

Learning outcomes:

The student is able to adapt the (skills) tools learned in previous courses to complete an energy production and management design project. The student will solve an engineering problem related to sustainable energy generation in cold climate.The student is able to describe the key practical issues related to sustainable energy generation. The student will evaluate the relevant instruments, tools and measures required for sustainable energy production, distribution, and end-use efficiency. The student will demonstrate the ability to select the proper tools, and methods to solve the design problem. The student will also acquire skills to work as a member in an engineering design project as part of a team. He/she will gain the experience to carry out a real project and produce a documentation of the engineering solution.

Contents:

A design project to adapt small-scale renewable energy production and management, greenhouse gas reduction and/or utilization, wind, solar, and geothermal energy generation. Management of energy efficiency. Energy engineering and design principles. Performance evaluation and sustainability assessment of the selected project. Problem solving.

Mode of delivery:

Team work, group meetings and seminars

Learning activities and teaching methods:

Lectures, design projects in small groups, presentations and reporting.

Target group:

Master’s degree students

Prerequisites and co-requisites:

The course 488202 Production and Use of Energy is a compulsory, and 488203S Industrial Ecology and 477309S Process and Environmental Catalysis courses are recommended prerequisites to the project

Recommended optional programme components:

-

Recommended or required reading:

Materials delivered on lectures and during the group meetings. *Additional literature:* Manuals and databases, depends on the project work selected.

Assessment methods and criteria:

Written report with the documentation of the engineering solution.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Mika Huuhtanen

Working life cooperation:

No

Other information:

-

555305M: Advanced Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

555306M: Elective Studies in other Universities /Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440269: Special Module, 0 - 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Special Module
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

International students should select 555212P, 030008P and 900017Y

555212P: Orientation Course for New Students, 1 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Leikkaavuudet:

555203P	Study Skills	2.0 op

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Ursula Heinikoski
Opintokohteen kielet: Finnish
Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:

1 ECTS credits / 27 hours of work

Language of instruction:

Finnish

Timing:

Architecture 3. spring semester, period I; Biochemistry 3. autumn semester; Biology 3. autumn semester, period I; Chemistry 3. autumn semester, period II; Computer Science and Engineering 2. spring semester, period IV; Electronics and Communications Engineering 3. spring semester; Geosciences 2. spring semester, period IV; Geography 1. and 3. spring semester, period III; I ndustrial Engineering and Management 3. year (Master's degree students in Industrial Engineering and Management 1st year.); Information Processing Sciences 1. year; Mathematics and Physics 1. spring semester, period III; Mechanical Engineering 3. year; Mining Engineering and Mineral Processing 3. year; Process and Environmental Engineering 2. year, period II.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information,
- can use the most important databases of their discipline,
- know how to evaluate search results and information sources,
- can use the reference management tool

Contents:

Scientific information retrieval process, the most important databases and publication channels of the discipline, evaluation of the reliability of information sources and RefWorks reference management tool.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises, a group assignment.

Learning activities and teaching methods:

Training sessions 8 h, group working 7 h, self-study 12 h

Target group:

Compulsory for all bachelor degree students of Faculty of Information Technology and Electrical Engineering, Faculty of Technology and Faculty of Science. Compulsory also for those Master's degree students in Industrial Engineering and Management who have no earlier studies in the information skills. Optional for the students of biochemistry.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material Tieteellisen tiedonhankinnan opas http://libguides.oulu.fi/tieteellinentiedonhankinta (in Finnish)

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Ursula Heinikoski

Working life cooperation:

-

Other information:

-

030008P: Information Skills for foreign degree students, 1 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Klintrup, Outi-Mirjami

Opintokohteen kielet: English

ECTS Credits:

1 ECTS credits / 27 hours of work

Language of instruction:

English

Timing:

International students in their 1st academic year, of Master's Degree Programme in Environmental Engineering and Industrial Engineering and Management (Product Management). The course is held once in the autumn semester, during period II and, once in the spring semester, during period IV.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information for their thesis,
- know how to evaluate search results and information sources,
- understand the principles of scientific publishing,
- can use a reference management tool.

Contents:

Scientific information retrieval and the search terms, the most important databases and publication channels of the discipline, tools for evaluating the quality of scientific information and RefWorks reference management tool.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Training sessions 8h, group work 7h, self-study 12 h

Target group:

The course is compulsory for the international students of Master’s Degree Programme in Environmental Engineering (BEE) and for the Master’s Degree Programme in Industrial Engineering and Management (Product Management)), and optional for other degree students working on their diploma/master’s thesis.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material: "Finding scientific information" http://libguides.oulu.fi/findinginformation

Assessment methods and criteria:

Passing the course requires active participation in the training sessions and successful completion of the course assignments.

Grading:

Pass/fail

Person responsible:

Ursula Heinikoski

Working life cooperation:

-

Other information:

-

900017Y: Survival Finnish, 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900017Y	Survival Finnish Course (OPEN UNI)	2.0 op

Proficiency level:

A1.1

Status:

The course is intended for the international students in every faculty of Oulu University.

Required proficiency level:

No previous Finnish studies.

ECTS Credits:

2 ECTS credits

Language of instruction:

Finnish and English

Timing:

-

Learning outcomes:

By the end of the course the student can understand and use some very common everyday expressions and phrases, and s/he can locate informational content in simple texts and messages. The student also knows the basic characteristics of Finnish language and Finnish communication styles.

Contents:

This is an introductory course which aims to help students to cope with the most common everyday situations in Finnish. During the course, students learn some useful everyday phrases, some general features of the vocabulary and grammar, and the main principles of pronunciation.

The topics and communicative situations covered in the course are: general information about the Finnish language, some politeness phrases (how to greet people, thank and apologize), introducing oneself, giving and asking for basic personal information, numbers, some time expressions (how to tell and ask the time, days of the week, time of day), food, drink and asking about prices.

The structures studied are: personal pronouns and their possessive forms, forming affirmative, negative and interrogative sentences, the conjugation of some verbs, the basics of the partitive singular and some local cases for answering the 'where'-question.

Mode of delivery:

Contact teaching, on-line learning and independent work. There will be organized also one on-line group in each semester.

Learning activities and teaching methods:

Lessons 2 times a week (26 h, including the final exam) and guided self study (24 h)

Target group:

International degree and post-graduate degree students and exchange students of the University

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Will be provided during the course.

Assessment methods and criteria:

Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grading scale is on a pass/fail basis.

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

Sign-up in WebOodi.

Recommended studies

555214A: Working in the university community, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish / English

Timing:

Periods 1-4

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the university community (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- analyse and find development targets related to the tasks

Contents:

Communication, collaboration, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills.

Mode of delivery:

The tuition will not be organised.

Learning activities and teaching methods:

Students complete tasks with their own activities to support the university community and their own professional growth.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management or similar knowledge.

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

The course can include several tasks as follows: Student Union 2 years 2 ECTS, University Board 1 year 2 ECTS, University Collegial Body 2 years 2 ECTS, Education Council 1 year 2 ECTS, Education Management Team 1 year 2 years, Faculty Management Team 1 year 2 ECTS, Faculty Board 2 years 2 ECTS, Faculty Education Council 2 years 2op, Student Union Board 1 year 1-3 ECTS, National Student Organisation 1 year 1-5 ECTS, Other major education policy and / or teaching development tasks 1-3 ECTS credits, Student Tutor or Teaching Assistant 2 ECTS cr.
The student writes a report on conducting the tasks, which includes the following: 1) In which positions did the student work, how long and how actively he/she participated? (0.5 pages). 2) What does the student think he/she has learned from the duties and how can the experience be utilized in the future? In particular, these skills should be considered: communication, co-operation, creativity, problem-solving, project management, learning, technical skills, international skills, commercial and financial skills and the development of self-knowledge (1 page). 3) How would the student think that the activity could be developed by the methods of industrial engineering and management? (1.5 pages). A report and a certificate on the tasks will be returned to the teacher tutor, who determines the number of credits to be awarded. The length of the report is 3 pages.

Grading:

pass / fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

-

555215A: Working life project, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish / English

Timing:

Periods 1-4

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the working life (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- analyse and find development targets related to the tasks

Contents:

Communication, collaboration, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills.

Mode of delivery:

The tuition will not be organised.

Learning activities and teaching methods:

Students complete tasks with their own activities to support their own professional growth.

Target group:

Industrial Engineering and Management students

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management or similar knowledge.

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Participation in a company project, competition or similar (e.g. Accenture innovation challenge, ESTIEM Times). The student writes a report on conducting the tasks, which includes the following: 1) In which positions did the student work, how long and how actively he/she participated? (0.5 pages). 2) What does the student think he/she has learned from the duties and how can the experience be utilized in the future? In particular, these skills should be considered: communication, co-operation, creativity, problem-solving, project management, learning, technical skills, international skills, commercial and financial skills and the

development of self-knowledge (1 page). 3) How would the student think that the activity could be developed by the methods of industrial engineering and management? (1.5 pages). A report and a certificate on the tasks will be returned to the teacher tutor, who determines the number of credits to be awarded. The length of the report is 3 pages.

Grading:

pass / fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

-

555310S: Demola Project, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

555300S: Master's Thesis, 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

470099S	Master's Thesis in Industrial Engineering and Management	30.0 op

ECTS Credits:
30 ECTS credits.
Language of instruction:
Finnish / English.
Timing:
Periods 1-4.
Learning outcomes:
Upon completion of the course, the student will be able to:

- solve challenging problems in organisations independently
- create a research plan, and define a research problem and research questions
- manage his own work according to the research plan
- utilise different information sources and critically evaluate the information obtained
- create a written report according to the instructions

Contents:
The research topic is selected in co-operation with the instructor.
Mode of delivery:
The tuition will be implemented as self-study and face-to-face teaching.
Learning activities and teaching methods:
Self-study 804 h. The student defines the research topic in co-operation with the instructor. The thesis is typically an empirical or a theoretical study.

Target group:
Industrial Engineering and Management students.
Prerequisites and co-requisites:
B.Sc. in Industrial Engineering and Management or equivalent. Courses that support the topic of the thesis.
Recommended optional programme components:
The students will complete 555301S Research seminar in industrial engineering and management simultaneously.
Recommended or required reading:
The instructions and forms related to master's thesis are available at Oulu University's Master's thesis webpage.
Assessment methods and criteria:
This course includes writing a Master's Thesis.The work is assessed by using th thesis assessment form.
Grading:
The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Adjunct professor Jukka Majava
Working life cooperation:
The thesis is typically done for a private or public sector organisation.
Other information:
The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage " Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" -menu.
Substitutes course 477991S Master's Thesis.

555302S: Maturity Test / Master of Science in Industrial Engineering and Management, 0 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555312S	Maturity Test / Industrial Engineering and Management	0.0 op

Assessment methods and criteria:
Maturity test related to the thesis topic is taken as an electronic exam in the Exam-system. Examination time is settled with the thesis supervisor. The assessor of the maturity test (supervisor) creates the maturity into the Exam system as a personal exam.
Grading:
Pass - Fail
Other information:
The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage " Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" -menu.

555207M: Basic Studies in other Universities/ Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440120: Basic and Intermediate Studies, Industrial Engineering and Management, 119,5 - 120 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Basic and Intermediate Studies
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

STUDY AND COMMUNICATION SKILLS

555203P: Study Skills, 2 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Leikkaavuudet:

555212P	Orientation Course for New Students	1.0 op

Other information:

Course tuition language is Finnish. Check the course description in Finnish.

900061A: Scientific Communication for Production Engineering and Management, 2 op

Voimassaolo: 01.08.2008 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Proficiency level:

-

Status:

Compulsory for the students undertaking the bachelor's degree in the Industrial Engineering and Management.

Required proficiency level:

-

ECTS Credits:

2 credits

Language of instruction:

Finnish

Timing:

The course begins in the first year of studies by introductory lessons and continues during the second or the third year of studies.

Learning outcomes:

The student should have mastered the basics of scientific communication. He/she should be able to view scientific writing as a process and prepare a scientific research report (among other scientific texts).

Contents:

Practises and distinctive features of scientific communication, writing as a process, critical and analytical reading strategies, style and language of science, essential questions of language planning.

Mode of delivery:

Multimodal teaching

Learning activities and teaching methods:

Introductory lessons 2 hrs, guiding in small gorups 3 hrs, distance teaching and independent study 49 hrs.

Target group:

Students undertaking the bachelor's degree in the Industrial Engineering and Management.

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is to be taken concurrently with the course 555204A Harjoittelu offered by the degree programme of Industrial Engineering and Management.

Recommended or required reading:

Material in Optima

Assessment methods and criteria:

Active participation in contact and distance teaching, independent study and completion of given assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass / fail

Person responsible:

Outi Mikkola

Working life cooperation:

Along with the course 555204A that includes practical training.

Other information:

-

900062P: Communicative Oral Skills for Production Engineering and Management, 2 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Proficiency level:

-

Status:

This course is obligatory for the Students of Industrial Engineering and Management and it is integrated to the Case course 555284A.

Required proficiency level:

-

ECTS Credits:

2 ECTS

Language of instruction:

Finnish

Timing:

the Autumn term of the 3rd year of studies

Learning outcomes:

Upon completion of the course the student should be familiar with the central principles of work and study-related communication, both oral and written, and be able to apply this knowledge in his/her own communication. The student should be able to analyse and assess his/her own writing and the writing of his/her peers. He/she should be able to act in group communication situations in a target-oriented manner. The student should also be able to give and receive constructive criticism. The student knows how to act efficiently in situations of group communication.

Contents:

Presentations, preparing a presentation, presenting techniques, argumentation, non-verbal communication, negotiating skills and conventions, observation and analysis of speech communication situations.

Mode of delivery:

multi-modal teaching

Learning activities and teaching methods:

Contact teaching and independent work

Target group:

Students of Industrial Engineering and Management

Prerequisites and co-requisites:

-

Recommended optional programme components:

This course is integrated to the Case course 555284A.

Recommended or required reading:

the material in the Optima learning environment

Assessment methods and criteria:

Active participation in contact teaching, independent study and completion of given assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1 - 5

Person responsible:

Sarajärvi, Niina

Working life cooperation:

-

Other information:

All the 2. practises are organized at TUTA-Studiem.
Group 2: 28.10. at 12.15-14, Group 1: 28.10. at 14.15-16, Group 3: 29.10. at 12.15-14 and Group 4: 29.10. at 14.15-16.

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Ursula Heinikoski

Opintokohteen kielet: Finnish

Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:

1 ECTS credits / 27 hours of work

Language of instruction:

Finnish

Timing:

Architecture 3. spring semester, period I; Biochemistry 3. autumn semester; Biology 3. autumn semester, period I; Chemistry 3. autumn semester, period II; Computer Science and Engineering 2. spring semester, period IV; Electronics and Communications Engineering 3. spring semester; Geosciences 2. spring semester, period IV; Geography 1. and 3. spring semester, period III; Industrial Engineering and Management 3. year (Master's degree students in Industrial Engineering and Management 1st year.); Information Processing Sciences 1. year; Mathematics and Physics 1. spring semester, period III; Mechanical Engineering 3. year; Mining Engineering and Mineral Processing 3. year; Process and Environmental Engineering 2. year, period II.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information,
- can use the most important databases of their discipline,
- know how to evaluate search results and information sources,
- can use the reference management tool

Contents:

Scientific information retrieval process, the most important databases and publication channels of the discipline, evaluation of the reliability of information sources and RefWorks reference management tool.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises, a group assignment.

Learning activities and teaching methods:

Training sessions 8 h, group working 7 h, self-study 12 h

Target group:

Compulsory for all bachelor degree students of Faculty of Information Technology and Electrical Engineering, Faculty of Technology and Faculty of Science. Compulsory also for those Master's degree students in Industrial Engineering and Management who have no earlier studies in the information skills. Optional for the students of biochemistry.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material Tieteellisen tiedonhankinnan opas http://libguides.oulu.fi/tieteellinentiedonhankinta (in Finnish)

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Ursula Heinikoski

Working life cooperation:

-

Other information:

-

FOREIGN LANGUAGE(choose one)

902150Y: Professional English for Technology, 2 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

902011P-05	TE3/ Professional English for Technology	2.0 op

Proficiency level:

CEFR B2 - C1

Status:

This course is the first English course for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills acquired otherwise. If you need to take English, but lack this background, please get in touch with the Languages and Communication contact teacher for your department to discuss individual solutions.

ECTS Credits:

2 credits. The workload is 53 hours.

Language of instruction:

English

Timing:

The course takes place in the autumn semester (periods 1 and 2).

Learning outcomes:

By the end of the course, you can
- create and deliver effective presentations of a product, a company and company processes,
- apply appropriate cultural, linguistic and technical knowledge when presenting a product or company,
- evaluate your own strengths and weaknesses in English-language communication, with a view to developing appropriate skills in future.

Contents:

Scheduled as the first course of your English studies, Professional English for Technology (PET) has a strong focus on developing speaking skills necessary for working life. During PET, you will explore a product or service from your own field, and give a variety of short presentations in connection with your product or service. In addition, PET helps you to develop an awareness of your own language skills, encouraging you to develop strategies and techniques for effective learning.

Mode of delivery:

Contact teaching and independent study

Learning activities and teaching methods:

Lessons 24 hours / independent work 29 hours. Lessons include regular pair and group work in class. Independent homework activities include team work for the preparation of four short presentations, vocabulary study and other small assignments. Active participation is essential.

Target group:

Students in the engineering programmes: TTK (PO1, YMP1, KO1, TuTa1, RaKy), TST (ST2, CSE2).

Prerequisites and co-requisites:

-

Recommended optional programme components:

This course is offered as the first course of your English studies.

Recommended or required reading:

Course materials will be provided by the teacher in electronic form.

Assessment methods and criteria:

The course utilises continuous assessment that is based on the learning outcomes of the course, including full and active participation in class, and the successful completion of module assignments and class presentations.
Lue lisää opintosuoritusten arvostelusta yliopiston verkkosivulta.

Grading:

pass / fail

Person responsible:

Each engineering programme has its own Languages and Communication contact teacher for questions about English studies.

Working life cooperation:

-

Other information:

-

902143Y: Company Presentations, 2 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opettajat: Susan McAnsh

Opintokohteen kielet: English

Proficiency level:

CEFR B2-C1 (Average - Advanced)

Status:

This course is part of the compulsory foreign language studies in English for students in the Industrial Engineering and Management (TuTa) programme.

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills acquired otherwise. If you need to take English, but lack this background, please get in touch with the Languages and Communication contact teacher for your department to discuss individual solutions.

ECTS Credits:

2 credits. The workload is 53 hours.

Language of instruction:

English

Timing:

The course is held in the autumn semester, during periods I and II.

Learning outcomes:

By the end of the course, students are expected to be able to:

- use principles of good presentation structuring for optimal clarity,
- establish and maintain audience rapport in the presentation setting,
- use principles of good slideshow design,
- present a company plan for Sales and Operations in English effectively, using appropriate style and vocabulary,
- use observation of self and others to continue developing and fine-tuning presentation skills.

Contents:

The aim of the course is to help students at all levels to better conceptualise what constitutes a good presentation, and to develop their confidence in giving presentations and interacting with an audience in a business context.
The early weeks of the course focus on development of vocabulary related to operations planning and oral activities in small groups. Students learn about key concepts in giving presentations, such as openings and closings, organisation of content, clear articulation, use of visual aids, and audience interaction.
In the second half of the course, teams of students plan, prepare and rehearse a company presentation on the Sales and Operations plan for a particular company. These activities lead to a team presentation in front of an audience.

Mode of delivery:

Contact teaching and independent study

Learning activities and teaching methods:

Lessons 24 hours / Independent work 29 hours.

Target group:

2nd year students of Industrial Engineering and Management

Prerequisites and co-requisites:

555225P Basics of Industrial Engineering and Management or similar knowledge.

Recommended optional programme components:

Students will simultaneously complete the *555226A Operations and Supply Chain Management* course.

Recommended or required reading:

Course materials will be provided by the teacher in electronic form, to be downloaded and brought to class.

Assessment methods and criteria:

The course utilises continuous assessment that is based on the learning outcomes of the course. In addition, full and active participation is required. Course assignments must be completed. Students must achieve a grade of 67% in the online vocabulary test and give a presentation as part of a team demonstrating the skills specified in the learning outcomes.

Grading:

Pass / fail.

Person responsible:

Suzy McAnsh

Working life cooperation:

-

Other information:

-

FOREIGN LANGUAGE(English 2 ECTS cr,elective)

902142Y: Business Correspondence, 2 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

CEFR B2 - C1 (All Levels)

Status:

This course can be chosen in partial completion of the English language requirement for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills acquired otherwise. If you need to take English, but lack this background, please get in touch with the Languages and Communication contact teacher for your department to discuss individual solutions.

ECTS Credits:

2 credits. The workload is 53 hours

Language of instruction:

English

Timing:

The course takes place in both autumn (periods 1 and 2) and spring (periods 3 and 4) semesters. Check the study guide for availability in your department.

Learning outcomes:

By the end of the course, you are expected to have demonstrated:

- the ability to write clear and effective business letters conveying information and details accurately,
- the ability to use an appropriate level of formality and style for business communications,
- mastery of the conventional formats and layouts of different types of business letters.

Contents:

The aim of this course is to introduce different types of business correspondence and the format used when communicating in writing. Types of correspondence include communication in business-to-business scenarios and between a business and the public.

Mode of delivery:

Self-access: the course operates within an online workspace, with online support from the teacher.

Learning activities and teaching methods:

Introductory session 2 hours / independent learning 51 hrs / optional text clinics. Assignments, instructions and course resources are available in the online course workspace. Completed assignments are submitted electronically to the teacher. The teacher provides feedback and any problems are discussed either by written electronic communication or at one of the optional text clinics.

Target group:

Students in the engineering programmes (TTK and TST)

Prerequisites and co-requisites:

-

Recommended optional programme components:

This is an elective course which can be taken after 902150Y PET by students in the engineering programmes (TTK, TST and OMS).

Recommended or required reading:

Course materials are provided in an electronic form that can be downloaded.

Assessment methods and criteria:

All assignments must be completed to a standard of effective business correspondence based on the learning outcomes of the course. In addition, there is a test at the end of the course.
Lue lisää opintosuoritusten arvostelusta yliopiston verkkosivulta.

Grading:

Pass/Fail

Person responsible:

See contact teachers

Working life cooperation:

-

Other information:

-

902145Y: Working Life Skills, 2 op

Opiskelumuoto: Language and Communication Studies

Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:

CEFR B2 - C1 (All Levels)

Status:

This course can be chosen in partial completion of the English language requirement for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills acquired otherwise. If you need to take English, but lack this background, please get in touch with the Languages and Communication teachers for your department to discuss individual solutions.

ECTS Credits:

2 ECTS credits. The workload is 53 hours.

Language of instruction:

English

Timing:

The course takes place in both autumn (periods 1 and 2) and spring (periods 3 and 4) semesters. Check the study guide for availability in your department.

Learning outcomes:

By the end of the course, you are expected to

1. have demonstrated a good basic vocabulary related to job applications, meetings and negotiations,
2. have demonstrated an ability to create an effective CV and cover letter for a job application,
3. be able to communicate effectively and with a reasonable degree of fluency at job interviews and in meeting and negotiation contexts.

Contents:

The aim of this course is to help you to develop the English language skills needed to deal with situations related to everyday working life. The course focuses on four basic areas:
i) business communication
ii) social and cultural aspects of English in working life situations,
iii) applying for a job,
iv) a general introduction to the language of meetings and negotiations.

Mode of delivery:

Contact teaching and independent study

Learning activities and teaching methods:

Lessons 26 hours / independent work 27 hours. Active participation is essential. The course includes regular pair and group work in class and independent homework activities.

Target group:

Students in the engineering programmes (TTK and TST).

Prerequisites and co-requisites:

-

Recommended optional programme components:

This is an elective course which can be taken after 902150Y PET by students in the engineering programmes (TTK and TST).

Recommended or required reading:

Course materials will be provided by the teacher in electronic form.

Assessment methods and criteria:

The course utilises continuous assessment that is based on the learning outcomes of the course. In addition, full and active participation is required, course assignments must be completed, and students must achieve a grade of 70% in two tests during the course. Students will be asked to take an end-of

course exam if they have not otherwise demonstrated that they have achieved the learning outcomes by the end of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

See contact teachers

Working life cooperation:

-

Other information:

-

CHOOSE ONE

901044Y: Second Official Language (Swedish), Written Skills, 1 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Opintokohteen kielet: Swedish

Leikkaavuudet:

901060Y	Second Official Language (Swedish), Written Skills	1.0 op

Proficiency level:

B1/B2/C1 (Common European Framework of Reference)

Status:

This course is compulsory to all students except those who have at least 60 ECTS credits of Swedish studies in their degrees. The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481/03).
According to the requirements of the law, the student must be able to use Swedish both orally and in writing in various professional situations. Achieving this kind of proficiency during a course unit that lasts for only one semester requires that the student has already achieved the necessary starting proficiency level prior to taking the course.
This course includes also 901045Y Second Official Language (Swedish) Oral Skills, 1 ECTS credits.

Required proficiency level:

The required starting proficiency level for students of all faculties is a grade of 7 or higher from the Swedish studies at secondary school (B-syllabus) or equivalent knowledge AND a passing grade from the proficiency test held at the beginning of the course unit. Based on this proficiency test the students are directed to brush up on their language skills if it is deemed necessary; mastering basic vocabulary and grammar is a prerequisite to achieving the necessary language proficiency for the various communication situations one faces in professional life.
If a student has not completed Swedish studies (B-language) at secondary school with a grade of 7 or higher, or his/her language skills are otherwise lacking, he/she must achieve the required proficiency level BEFORE taking this compulsory Swedish course.

ECTS Credits:

2 ECTS credits

Language of instruction:

Swedish

Timing:

Studenst of Students of Industrial Engineering and Management : autumn semester of the 2nd year of studies
Students of Process Engineering and Environmental Engineering: autumn or spring semester of

the second year of studies
Mechanical Engineering: autumn or spring semester of the third year of studies

Learning outcomes:

Upon completion of the course unit the student should be able to read and understand texts from his/her academic field and make conclusions based on them. The student should be able to write typical professional emails and short reports. He/she should be able to carry himself/herself according to Swedish etiquette when acting as host or guest. The student should also be able to discuss current events and special field-specific matters, use the vocabulary of education and plan and give short oral presentations relating to his/her own field.

Contents:

Communicative oral and written exercises, which aim to develop the student's Swedish proficiency in areas relevant to his/her academic field and future professional tasks. The student practises oral presentation and pronunciation. Situational exercises done individually and in pairs and groups. Discussions in small groups. Current texts about the student's special field. Written exercises relating to the student's professional field. Practising presentation skills.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

1 x 90 minutes of contact teaching per week and self-directed study, 53 hours per course.

Target group:

See Timing

Prerequisites and co-requisites:

See Required Proficiency Level

Recommended optional programme components:

-

Recommended or required reading:

Study material will be provided by the teacher.

Assessment methods and criteria:

The course unit focuses on improving both oral and written language skills and requires active attendance and participation in exercises, which also require preparation time. 100% attendance is required. The course unit tests both oral and written language skills.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Oral and written language proficiencies are tested separately and assessed using the so called KORU-criteria (publication of HAMK University of Applied Sciences, 2006). Separate grades will be awarded for the successful completions of both oral and written portions of the course unit: the possible passing grades are **satisfactory skills and good skills** (see language decree 481/03). The grades are based on continuous assessment and testing.

Person responsible:

See contact teachers on the Language and Communication home page http://www.oulu.fi/languagesandcommunication/student_counselling

Working life cooperation:

-

Other information:

Students sign up for teaching in WebOodi. Sign up only to a course 901044Y Second Official Language (Swedish) Written Skills, 1 ECTS credits.
A student can only sign up for one teaching group. When signing up , it is imperative that the student fills in his/her university email address (paju.oulu.fi), major subject and Swedish grades attained during secondary education in the Further Information field. Information in sign-up periods and course unit timetables can be found in WebOodi.

901045Y: Second Official Language (Swedish), Oral Skills, 1 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Opintokohteen kielet: Swedish

Leikkaavuudet:

901061Y	Second Official Language (Swedish), Oral Skills	1.0 op

MATHEMATICS

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pauliina Uusitalo, Ilkka Lusikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031010P	Calculus I (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish. The course can be completed in English by intermediate exams or by a final exam.

Timing:

Autumn semester, period 1

Learning outcomes:

Upon completion of the course, the student identifies concepts of vector algebra, can use vector algebra for solving problems of analytic geometry, can explain basic characteristics of elementary functions, is able to analyse the limit and the continuity of real valued functions of one variable, can solve problems associated with differential and integral calculus of real valued functions of one variable.

Contents:

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Grossman, S.I.: Calculus of One Variable; Grossman, S.I.: Multivariable Calculus, Linear Algebra, and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly)

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Pauliina Uusitalo

Working life cooperation:

-

Other information:

-

031078P: Matrix Algebra, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Matti Peltola

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031078P	Matrix Algebra (OPEN UNI)	5.0 op
031019P	Matrix Algebra	3.5 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn, during period 2. It is recommended to complete the course at the 1th autumn semester.

Learning outcomes:

The student is able to apply arithmetic operations of matrices and can solve system of linear equations by matrix methods and can apply matrix factorizations to find the solution of the system of linear equations. The student is able to recognize the vector space and understands the concepts of basis and dimension of a vector space and can analyse matrices by the parameters, vectors and vector spaces of matrices. He /She knows how to calculate determinant, eigenvalues and eigenvectors of a square matrix, and is able to diagonalize matrices and apply diagonalization to the simple problems.

Contents:

1. Vectors and matrices 2. Systems of linear equations. 3. Matrix factorizations. 4. Vector spaces. 5. The rank, nullity, row space and the column space of a matrix. 6. The determinant of a matrix. 7. Eigenvalues and eigenvectors of a matrix. 8. The diagonalization with applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 h.

Target group:

1. year students of technical sciences, mathematics and physics.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Recommented literature: Grossman, S.I: Elementary Linear Algebra; David C. Lay: Linear Algebra and Its Applications.

Assessment methods and criteria:

The course can be completed by intermediate exams (2 exams) or by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail

Person responsible:

Matti Peltola

Working life cooperation:

-

Other information:

-

031075P: Calculus II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pauliina Uusitalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031075P	Calculus II (OPEN UNI)	5.0 op
031011P	Calculus II	6.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish. The course can be completed in English by intermediate exams or by a final exam.

Timing:

Spring semester, period 3

Learning outcomes:

Upon completion of the course, the student is able to examine the convergence of series and power series of real terms, can explain the use of power series e.g. in calculating limits, is able to solve problems related to differential and integral calculus of real and vector valued functions of several variables.

Contents:

Sequences, series, power series and Fourier series of real terms. Differential and integral calculus of real and vector valued functions of several variables.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 h.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the course 031010P Calculus I.

Recommended optional programme components:

-

Recommended or required reading:

Kreyszig, E: Advanced Engineering Mathematics; Grossman S.I.: Multivariable Calculus, Linear Algebra, and Differential Equations; Adams, R.A.: A Complete Course Calculus.

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Ilkka Lusikka

Working life cooperation:

-

Other information:

-

031076P: Differential Equations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ruotsalainen Keijo

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031076P	Differential Equations (OPEN UNI)	5.0 op
800320A	Differential equations	5.0 op
031017P	Differential Equations	4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring, during period 4. It is recommended to complete the course at the 1th spring semester.

Learning outcomes:

The students can apply differential equations as a mathematical model. They can identify and solve various differential equations and they have knowledge on basic solvability of differential equations. The student can use the Laplace transform as a solution method.

Contents:

Ordinary differential equations of first and higher order.
Laplace transform with applications to differential equations.

Mode of delivery:

Face-to-face teaching, Stack/Moodle digital learning environment

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 h.

Target group:

1. year students of engineering, mathematics and physics.

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the course Calculus I.

Recommended optional programme components:

-

Recommended or required reading:

Recommended literature: Kreyszig, E: Advanced Engineering Mathematics;

Assessment methods and criteria:

The course can be completed by intermediate exams (2 exams) or by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Keijo Ruotsalainen

Working life cooperation:

No

031021P: Probability and Mathematical Statistics, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kemppainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031021P	Probability and Mathematical Statistics (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

Spring semester, period 3

Learning outcomes:

After completing the course the student

1. knows the key concepts of probability and the most important random variables,
2. will be able to use them in calculating probabilities and parameters of probability distributions,
3. is capable of analyzing statistical data by calculating interval and point estimates for the parameters,
4. will be able to formulate statistical hypotheses and test them,
5. knows the basics of linear regression.

Contents:

The key concepts of probability, random variable, parameters of probability distributions, estimation of parameters, hypothesis testing, regression analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h/Exercises 20 h/Self study 87 h.

Target group:

The students in the engineering sciences. Other students are welcome, too.

Prerequisites and co-requisites:

The recommended prerequisities are the course 031010P Calculus I and some parts of the course 031075P Calculus II.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Milton, J.S., Arnold, J.C. (1992): Introduction to Probability and Statistics.

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Jukka Kemppainen

Working life cooperation:

-

PHYSICS

761118P: Mechanics 1, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Vaara, Juha Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
766323A	Mechanics	6.0 op
761323A	Mechanics	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work
- 761118P-01, Lectures and exam (4 cr)
- 761118P-02, Lab. exercises (1 cr)

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 2-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Both parts (761118P-01 and 761118P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761118P-01: Three midterm exams or final examination
761118P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761118P

761119P: Electromagnetism 1, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Asikainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
761113P	Electricity and magnetism	5.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work
- 761119P-01, Lectures and exam (4 cr)
- 761119P-02, Lab. exercises (1 cr)

Language of instruction:

Finnish

Timing:

Second fall term

Learning outcomes:

The student will be able to understand the basic concepts of electromagnetism and can apply this understanding to solve problems related to electromagnetism.

Contents:

Basic principles of electromagnetic phenomena and their physical and geometric interpretation. More detailed contents will be presented later.

Mode of delivery:

face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13. ed., chapters 21-31. Also other editions can be used. Lecture material in finnish.

Assessment methods and criteria:

Both parts (761119P-01 and 761119P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761119P-01: Three small midterm exams or final examination
761119P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Timo Asikainen

761310A: Wave motion and optics, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Alanko

Opintokohteen kielet: Finnish

Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish. The course material and exercises are available in English.

Timing:

First spring

Learning outcomes:

The student is able to treat different types of waves by methods of general theory of wave motion. The student is also able to solve problems related to basic optics and apply her/his knowledge to teaching and research in physics.

Contents:

General principles of wave motion, sound, electromagnetic waves, propagation of light, image formation in mirrors and lenses, optical instruments, interference, Fraunhofer diffraction, diffraction grating.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, 2 laboratory exercises (3 hours/exercise), self-study 90 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

Basic skills in mathematics.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

H. D. Young and R. A. Freedman, University Physics, Addison-Wesley, 2000 ja 2004, F. L. Pedrotti ja L. S. Pedrotti, Introduction to optics, Prentice-Hall, 2. ed., 1993 ja E. Hecht, Optics, (3rd ed.), Addison Wesley Longman, 1998.

Assessment methods and criteria:

Two written intermediate examinations or one final examination

Grading:

Numerical grading scale 0 – 5, where 0 is fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Other information:

Includes parts:
761310A-01 Wave motion and optics, lectures and exam
761310A-02 Wave motion and optics, lab. exercises

COMPUTER SCIENCE

521141P: Elementary Programming, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Oja

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521141P Elementary Programming (OPEN UNI) 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS Cr

Language of instruction:

Lectures and learning material are in Finnish. The course is not available English.

Timing:

Fall, periods 1-2.

Learning outcomes:

1. Is capable of solving problems in the computer's terms

2. Understands the basic concepts of programming

3. Knows the basics of the Python programming language

4. Is able to implement programs independently

5. Is able to use the internet to find information about programming

Contents:

Problem solving with programming, basic concepts of programming, writing Python code.

Mode of delivery:

Web-based teaching + face-to-face teaching

Learning activities and teaching methods:

30h of exercise groups, 105h self-studying in the web.

Target group:

1 st year students of computer science and engineering, electrical engineering, medical and wellness technology and industrial and engineering management, 2nd year students of physics, and other students of the University of Oulu

Prerequisites and co-requisites:

None.

Recommended optional programme components:

The course provides a basis for subsequent programming courses.

Recommended or required reading:

Web material in an online learning environment. Address will be announced at the beginning of the course.

Assessment methods and criteria:

The course is completed by passing all learning assignments, programming exercises and a final exercise project. Read more about assessment criteria at the University of Oulu webpage
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail.

Person responsible:

Mika Oja

Working life cooperation:

-

ECONOMICS

724110P: Introductory Economics, 5 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Business School

Arvostelu: 1 - 5, pass, fail

Opettajat: Marko Korhonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay724110P	Introductory Economics (OPEN UNI)	5.0 op
721211P	Principles of Economics	10.0 op
721210P	Principles of Economics	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

Period 1 (1st year)

Learning outcomes:

After completing the course students (i) understand the basic concepts of economics and the rudiments of economic theory, (ii) can explain the determination of resource allocation and prices in a market economy, (iii) know how the aggregate economy operates in the short and long run, and (iv) how economic policy affects the economy.

Contents:

The course introduces students to the tools and ideas economics uses to describe and explain economic phenomena. The topics include:
-basic ideas and principles of economics
-opportunity cost and comparative advantage
-market equilibrium: demand and supply
-how well does market economy work?
-firms and competition in market economy
-aggregate economic activity and its measurement
-business cycles
-economic growth

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

36 lectures including possible problem sets. Students are expected to do the problem sets on their own and familiarize themselves with the required and recommended materials (93 h). Mid-term exams or Final Exam

Target group:

Major students in economics and business administration

Prerequisites and co-requisites:

-

Recommended optional programme components:

This course is part of “Introduction to business studies” -module

Recommended or required reading:

Material posted at the webpage. Textbook:

Acemoglu, D., Laibson D. and List, J.A., Economics, 2018 ja oheislukemisto: Timothy Taylor, The Instant Economist. Everything You Need to Know About How the Economy Works. 2012. A Plume Book (Penguin), New York NY. Robert P. Murphy, Lessons for the Young Economist. Ludvig von Mises Institute 2010; http://mises.org/books/lessons_for_the_young_economist_murphy.pdf

Assessment methods and criteria:

Mid-term exams or Final exam

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Marko Korhonen

Working life cooperation:

Students learn relevant and useful facts about the operation of the markets, and the aggregate economy to an extent that they can reasonably utilize those facts and knowledge in the decision making of the business they are working at.

Other information:

The number of students is limited.

724105P: Management Accounting, 5 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Business School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay724105P Management Accounting (OPEN UNI) 5.0 op

721172P Management Accounting 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 credits

Language of instruction:

English (course is lectured separately in Finnish and in English).

Timing:

Period 1 (2nd year)

Learning outcomes:

After passing the course, the student knows the basic cost concepts and the elements of cost accounting systems. Students are also able to apply the basic cost information in the company’s decision making and explain which costs should be included in these calculations under different circumstances.

Contents:

Theoretical framework for understanding cost accounting, cost concepts, cost recording, different product costing methods, cost-volume-profit analysis, using cost accounting information in decision making.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

20 h lectures, 14 h exercises and independent reading of study materials and doing assignments (99 hours).

Target group:

Major students in economics and business administration

Recommended optional programme components:

This course is part of "Business Processes" -module

Recommended or required reading:

Drury, C.: Management and cost accounting, 7th or 8th ed. Cengage Learning EMEA. Chapters 1-11 (8th ed.);
Supplementary material: Järvenpää, M.- Länsiluoto, A - Partanen, V. – Pellinen, J.: Talousohjaus ja kustannuslaskenta, WSOYpro, chapters 1-8.

Assessment methods and criteria:

Lectures and literature examination.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Tiina Henttu-Aho

Working life cooperation:

Understanding of management accounting systems is typically an important part of work for graduates in economics and business administration and an essential part of occupations like management accountant or controller.

Other information:

The number of students is limited.

555213A: Sales and marketing, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- understand and apply basic terminology of sales and marketing and the fundamentals of customer oriented approach
- recognise sales and marketing process phases, plan product and service offerings for a particular customer segment, and create sales and marketing plan
- explain the following concepts: sales pipeline, segmentation, marketing mix, value proposition and branding

listen and develop a customer’s need, and present and defend one’s own value proposition

Contents:

Customer’s buying behavior, planning product and service offerings, communicating value, basics of sales and marketing, customer oriented approach, sales and marketing processes and plans, sales pipeline, segmentation, value proposition, marketing mix and branding.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures and exercises 18 h / group work 79 h / self-study 37 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 724105P Management accounting or similar knowledge.

Recommended optional programme components:

-

Recommended or required reading:

Parviainen, P. (2013) Myyntipsykologia: Näin meille myydään. Docendo Oy. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilises continuous assessment. During the course, there are individual assignments and a sales simulation exercise (50 % of the grade) and a group work (50 % of the grade).

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

The students will do a group work in cooperation with case companies.

Other information:

Substitutes courses 721412P Product and Market Strategies (2013 - 2014) and 724106P Principles of Marketing (2014 - 2015) in IEM student's PSP's.

IEM STUDIES

555225P: Basics of industrial engineering and management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555225P	Basics of industrial engineering and management (OPEN UNI)	5.0 op
555221P	Introduction to Production	2.0 op
555220P	Basic Course in Industrial Engineering and Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Period 1.

Learning outcomes:

Upon completion of the course, the student will be able to:

- describe what industrial engineering and management (or operations management) means
- explain the core concepts of business operations and utilise these concepts in describing and analysing operations of an organisation
- explain in general terms the factors that affect economic performance of organisations
- utilise the terminology used in industrial engineering and management (operations management), describe the financial processes of companies and based on this describe the use of cost accounting in organisational decision-making
- calculate unit costs in various simplified settings, calculate various alternatives, as well as perform planning and goal oriented calculations based on given data, and draw conclusions based on the calculation results

Contents:

Operations and productivity, operations strategy, forecasting, accounting and cost accounting, investments and financial planning, sustainability, capacity management, location decisions, layout strategies, human resources management, supply chain management, subcontracting, inventory management, production planning, MRP & ERP, production scheduling, Just-in-Time & Lean operations, maintenance.

Mode of delivery:

Web-based teaching 20 hours / practices 14 hours / Independent studying 100 hours.

Learning activities and teaching methods:

Web-based lectures 20 h / exercises 14 h / self-study 100 h.

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended or required reading:

Lecture and exercise materials. Heizer, J. & Render, B. (2014) Operations management: sustainability and supply chain management, 11th ed. Pearson. In addition, recommended materials include Martinsuo, M. et al. (2016) Teollisuustalous kehittyvässä liiketoiminnassa chapters 7-9, 16 and 26.

Assessment methods and criteria:

This course utilises continuous assessment. During the course, there are seven mandatory weekly assignments.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

Substitutes courses 555220P Basic Course in Industrial Engineering and Management 3 ECTS cr and 555221P Introduction to Production 2 ECTS cr.

555285A: Project management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Kirsi Aaltonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

555288A Project Management 5.0 op
ay555285A Project management (OPEN UNI) 5.0 op
555282A Project Management 4.0 op
555280P Basic Course of Project Management 2.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material may also be used.

Timing:

Period 2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- describe explain the essential concepts and methods related to project management
- apply project management methods to create a schedule for a project and calculate critical path
- understand essential concepts related to project cost management and able to apply earned value method and three point estimate to manage project costs
- recognises the essential tasks of project risk management

Contents:

Defining project management, project goals and objectives, project phases and project life-cycle management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management, project stakeholder management, project communications management, the role of project manager, new modes of project delivery

Mode of delivery:

The tuition will be implemented as web-based teaching.

Learning activities and teaching methods:

Web-based lectures 16h, self-study 118h

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes555225P Basics of industrial engineering and management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended or required reading:

Lecture material, exercise book, Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY

Assessment methods and criteria:

Assignments, exercise book and exam. The course grading is based on the exam. Well completed assignments and exercise book may raise grading.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

The course includes guest lectures from industry

Other information:

Substitutes courses 555280P Basic Course of Project Management + 555282A Project Management.

555265P: Occupational Safety and Health Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Henri Jounila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555263A	Technology, Society and Work	2.0 op
555260P	Basic Course in Occupational Safety and Wellbeing at Work	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the basic terms of occupational safety and health
- assess the importance of occupational safety, health and well-being at work
- assess the significance of occupational safety in the improving of productivity and quality
- apply different safety analysis
- explain core issues of occupational safety and health management

Contents:

Occupational safety and health, safety management, safety culture, laws and standards, hazards and risks, occupational diseases and work accidents, safety analysis, occupational safety at shared industrial work sites, occupational safety card, HSEQ-assessment procedure, other current issues.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures and assignments 26 h / group work 40 h / tasks and self-study 68 h.

Target group:

Industrial Engineering and Management, Mechanical Engineering, Process Engineering and Environmental Engineering students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Mertanen V. 2015. Työturvallisuuden perusteet. Helsinki: Työterveyslaitos. Lecture materials. Other materials will be defined during the course.

Assessment methods and criteria:

Group work 0-5, the assessment of the tasks will be informed at the beginning of the course.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

MSc Henri Jounila

Working life cooperation:

-

Other information:

Substitutes courses 555260P Basic Course in Occupational Safety and Wellbeing at Work + 555263A Technology, Society and Work.

555226A: Operations and supply chain management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

555222A	Demonstration in Industrial Engineering and Management	2.0 op
555223A	Introduction to Production Control	3.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

English.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion of the course, the student will be able to:

- describe different production types
- apply different forecasting methods, plan needed production capacity, and apply location and transportation decisions related methods
- master common inventory management methods and aggregated and short-term scheduling
- create a sales and operations plan for a company

Contents:

Production types, forecasting methods, capacity planning and queuing models, location and transportation decisions, inventory management systems, aggregate scheduling, MRP & ERP, short-term scheduling, linear programming.

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 16 hours / independent studying 64 hours.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management or similar knowledge.

Recommended optional programme components:

Industrial Engineering and Management students will complete 902143Y Company presentations course simultaneously.

Recommended or required reading:

Lecture and exercise materials. Krajewski, L.J. et al. (2012) Operations management: processes and supply chains, 10th ed. Pearson. In addition, recommended material includes chapter 13 in Heizer, J. & Render, B. (2014) Operations management: sustainability and supply chain management, 11th ed. Pearson.

Assessment methods and criteria:

This course utilises continuous assessment. During the course, there are mandatory weekly assignments. At least half of the assignments must be passed. 40 % of the grade is based on the group work.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Post-doctoral researcher Farzad Pargar.

Working life cooperation:

The group work will be done for a real company by using public information sources.

Other information:

Substitutes course 555222A Demonstration in Industrial Engineering and Management 2 ECTS cr and 555223A Introduction to Production Control 3 ECTS cr.
Previous course name was 'Operations and Production'.

555264P: Managing well-being and quality of working life, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Reiman

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555264P	Managing well-being and quality of working life (OPEN UNI)	5.0 op
555261A	Basic Course in Occupational Psychology	3.0 op
555262A	Usability and Safety in Product Development	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- set targets and choose appropriate methods of developing well-being at work both at personal and organizational levels
- develop well-being at work in the contexts of labor legislation, good practices, productivity, occupational safety expertise, management and human resources
- know the key sources of information, typical goal-setting and management practices and the methods for assessing the performance at individual and organizational levels
- assess the economic impacts of well-being at work, especially in cases of work ability, occupational health, job satisfaction, occupational safety, productivity and the overall quality of working life
- know essential national and international regulation and strategic goal setting practices, good practices of the case companies, current trends, and methods in research.

Contents:

The course gives the student a vision of building sustainable, productive and satisfactory career. The contents cover the whole area of basic quality issues of working life analysing them in the following framework "Well-being at work means safe, healthy, and productive work in a well-led organisation by competent workers and work communities who see their job as meaningful and rewarding, and see work as a factor that supports their life management".

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Lectures 10 h / self-study 70 h / group work & exercises 42 h.

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial Engineering and Management that also includes 555225P Basics of industrial engineering and management**,** 555285P Project Management, 555242A Product development, and 555286A Process and quality management.

Recommended or required reading:

Applicable parts of Arnold, J. et al. (2010), Work Psychology; Understanding Human Behaviour in the Workplace. 5th Edition. Financial Times/Prentice Hall and Aura, O. & Ahonen, G. Strate-gisen hyvinvoinnin johtaminen, Alma Talent. Other literature will be informed during the course.

Assessment methods and criteria:

This course utilises continuous assessment including exercises during the lectures (weight 20 %), group work (weight 40 %) and examination (weight 40 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Dr. Arto Reiman

Working life cooperation:

-

Other information:

Substitutes courses 555261A Basic Course in Occupational Psychology + 555262A Usability and Safety in Product Development.

555286A: Process and quality management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Osmo Kauppila

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555286A	Process and quality management (OPEN UNI)	5.0 op
555281A	Basic Course of Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 4.

Learning outcomes:

Upon completion of the course, the student will be able to:

- explain the role of process and quality management in a business organisation
- develop business processes based on the principles of quality management and appropriate tool

Contents:

Foundations of total quality management, planning of quality, performance measurement, process management, people management in relation to quality management, implantation of total quality management.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

20 h lectures, 114 h independent study

Target group:

Industrial Engineering and Management students and other students studying Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

-

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes 555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, and 555264P Managing well-being and quality of working life.

Recommended or required reading:

Oakland, J.S. (2014) Total quality management and operational excellence (4th ed.). Routledge, 529 pp. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must pass the weekly course exercises (50 % of the course grade) and an exam (50 %).

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555281A Basic Course of Quality Management.

555242A: Product development, 5 op

Voimassaolo: 01.01.2014 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Haapasalo, Harri Jouni Olavi
Opintokohteen kielet: English
Leikkaavuudet:

ay555242A	Product development (OPEN UNI)	5.0 op
555240A	Basic Course in Product Development	3.0 op

Ei opintojaksokuvauksia.

555287A: Problem Solving in Business Cases, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Leikkaavuudet:

555284A	Problem Solving in Business Cases	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 1-2.

Learning outcomes:

Upon completion the student can systematically analyse the challenges related to a company’s business as a part of a group, apply problem solving tools and processes to develop and present alternative solutions to business challenges related to strategy or operations. The student is able to analyse and develop the functioning of a group. The student is able to evaluate and improve his/her presentation skills.

Contents:

problem solving tools and processes, team work, presentations skills, topical challenges related to business strategy and operations.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 36h, self-study 36h, group exercise 62h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 555285A Project management, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended optional programme components:

The students will complete 900062P Tuotantotalouden suullinen viestintä course simultaneously.

Recommended or required reading:

Lecture material. Other materials will be defined at the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. Learning diary and participation in lectures, each group exercise in case solving and designing a case will be evaluated. 70% of the grade is based on group exercises.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jaakko Kujala.

Working life cooperation:

No.

Other information:

Substitutes course 555284A roblem Solving in Business Cases.

555204A: Internship, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555210A	Practice	3.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish.

Timing:

Periods 1-4.

Learning outcomes:

The objective is to familiarise students to industrial engineering and management in practical work life. During the course, students learn to observe his/her working environment from theoretical viewpoints of

Industrial Engineering and Management (IEM). From the working environment, the student is able to identify IEM themes and classify them. The student is able to select theoretical references relevant for the topic and is able to evaluate the working environment based on the theoretical references. The student is able to draw up a report based on given instructions.

Contents:

To be defined by the student.

Mode of delivery:

Students will write a report concerning summer job. The length of the summer job has to be 2 months minimum.

Learning activities and teaching methods:

Students will write a report concerning summer job. Student's personal teacher tutor will review and grade the report.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

Report writing is integrated with the course 900061A Scientific Communication for Industrial Engineering and Management.

Recommended or required reading:

-

Assessment methods and criteria:

The Report.

Grading:

Fail/Pass

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

Yes

Other information:

Substitutes course 555210A Internship.

555208M: Intermediate Studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440149: Module Preparing for the Major, Electrical Engineering, 40 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common studies

521109A: Electrical Measurement Principles, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Saarela
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 136h

Language of instruction:

Course is lectured in Finnish. Lecture notes are available in English. Laboratory exercises and the exam can be done in English.

Timing:

Periods 1-2.

Learning outcomes:

1. is able to measure basic measurements with a multimeter,

2. is able to measure basic measurements with an oscilloscope,

3. is able to operate signal and function generators.

4. is able to estimate the validity of their measurements.

Contents:

Units of measures, standards of measures, analysis of errors, most commonly used analog and digital measuring methods, equipment and electrical safety regulations.

Mode of delivery:

Pure face-to-face teaching.

Learning activities and teaching methods:

Lectures 20h, laboratory exercises 16 h and self-study 100h.

Target group:

Course is compulsory for electrical engineering, information engineering and wellness technology students. Course is open for all students in University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

None.

Recommended or required reading:

Course material is in English and Finnish and can be found in Optima.

Assessment methods and criteria:

Exam and passed lab exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grade is based on exam and grade is on numerical scale 1-5.

Person responsible:

Juha Saarela

Working life cooperation:

None.

Other information:

-

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Rahkonen, Timo Erkki
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Spring, period 4

Learning outcomes:

After the course the student can

1. write and solve the equations describing the operation of a given electrical circuit

2. solve the sinusoidal steady-state solution using complex phasor arithmetics

3. solve time responses of electric circuits

4. simplify electrical circuits e.g. using equivalent circuits

5. simulate simple circuits and choose an appropriate circuit simulation method

Contents:

Equation of basic circuit elements, circuit laws and systematic building of network equations. Calculation of time and frequency responses. Use of complex phasor arithmetics. Basics of the use of circuit simulators.

Mode of delivery:

Classroom.

Learning activities and teaching methods:

30h lectures, 22h exercises, and a simulation exercise.

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Matrix algebra, complex arithmetics, differential equations.

Recommended optional programme components:

Background to all analog electronics cources.

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 1-11.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed
Read more about assessment criteria at the University of Oulu webpage..

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

521301A: Digital Techniques 1, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Lahti

Opintokohteen kielet: Finnish

Leikkaavuudet:

521412A-02	Digital Techniques 1, Exercise Work	0.0 op
521412A	Digital Techniques 1	6.0 op
521412A-01	Digital Techniques, Exam	0.0 op

ECTS Credits:

8

Language of instruction:

Finnish

Timing:

Periods 3-4

Learning outcomes:

1. After the course, students are able to ably binary number system and Boolean algebra in the form of switching algebra to the design and functional analyze of simple digital circuits.
2. In addition, they are also able to use in their designs graphical symbols specified in the dependency notation standard (SFS4612 ja IEEE/ANSI Std.91-1991) and different descriptions of function and structure of state machines.
3. Based on this knowledge, students are able to implement and analyze digital devices consisting of ordinary simple digital components.
4. After having assimilated the basic knowledge of digital technique, students are able to understand also the function and structure of micro controllers and micro processors.

Contents:

The principles of digital devices, Boolean algebra, numeral systems, operating principle, analysis and synthesis of combinational logic, flip-flops, operating principle, analysis and synthesis of sequential logic (state machines), physical characteristics of CMOS technology, registers and register transfers, computer memory, instruction set architecture, computer design basics, interfaces and data transmission.

Mode of delivery:

Classroom

Learning activities and teaching methods:

Fundamentals of digital techniques: Lessons 32h, independent work (homework assignments) 106h, teaching period 3
Fundamentals of computer engineering: Lessons 8h, independent work (homework assignment) 47h, teaching period 3
Project work: Independent work 55h, teaching period 4

Target group:

Primarily 1st year electrical engineering and computer science and engineering BSc students. The course can be taken by the students of the university of Oulu.

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Textbook: Mano: Logic and Computer Design Fundamentals, MIT OpenCourseWare and execise literature.

Assessment methods and criteria:

Homework assignment and project work.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

Jukka Lahti

Working life cooperation:

No

Other information:

-

Electronics

521077P: Introduction to Electronics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521077P	Introduction to Electronics (OPEN UNI)	5.0 op
521209A	Electronics Components and Materials	2.0 op

ECTS Credits:

5 ECTS credits / 132,5 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the 1st period. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

1. Student understands the block structures of electronic devices and their signal processing paths.

2. Student can identify the interfaces of analog and digital electronics and the software operations.

3. Student is able to identify and classify electronics components and compare their properties.

4. Students can describe electric conductivity and apply the phenomenon on designing and choosing resistors

5. Student is able to estimate the difference between dielectric materials and how they affect the properties of a capacitor.

6. Student can compare properties of magnetic materials and how identify they effect on inductive components.

7. Student can identify semiconductivity and is able to list typical semiconductor components.

8. Student can classify different circuit board techniques and is able to choose proper coupling techniques.

9. Student can identify the future technologies of electronics materials.

Contents:

Structures and interfaces of electronic devices. Electromagnetic properties of materials (conductivity, dielectricity, magnetism and semiconductivity).Electronics components (resistors, capacitors, inductive components and semiconductors). Interconnection technologies and circuit board technologies. The future of electronic materials and application areas.

Mode of delivery:

Face-to-face teaching and independent work.

Learning activities and teaching methods:

The implementation methods of the course vary. The course will be arranged utilizing activating teaching methods agreed on together with the students. There will be 48 hours of guided teaching events and 84.5 hours of teaching without guidance either privately or in a group.

Target group:

First year electrical engineering students.

Prerequisites and co-requisites:

No prerequisites.

Recommended optional programme components:

-

Recommended or required reading:

Lecture material; Materials science and engineering: an introduction / Willam D. Callister, chapters 1, 18 and 20; Electronic components and technology / S. J. Sangwine. Chapters 1,2,3,5 and 7

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are two intermediate exams. In addition students will make course work which are graded. The assessment of the course is based on the learning outcomes of the course. Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jari Hannu

Working life cooperation:

No

Other information:

-

521104P: Introduction to Material Physics, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Hagberg, Jani Peräntie
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 132,5 hours of work

Language of instruction:

Finnish.

Timing:

Autumn semester period 1

Learning outcomes:

1. is able to explain the principal solid state crystal structures

2. can explain how propagating waves and electrons in a crystal lattice can be presented

3. can explain the free electron model of metals and the formation of the energy band structure in crystals and their significance to the electrical properties of materials

4. is able to explain the basic phenomena related to semiconductors and is able to calculate the charge carrier concentrations in them

Contents:

Crystal structures, cohesion and defects. Reciprocal lattice and waves in crystals. Statistical mechanics and thermal vibration. Free electron model of metals. Energy bands in crystal. Basic phenomena of semiconductors.

Mode of delivery:

Will be notified in the beginning of lectures

Learning activities and teaching methods:

Will be notified in the beginning of lectures

Target group:

Second year electrical engineering students

Prerequisites and co-requisites:

Basic physics and mathematics.

Recommended optional programme components:

Basic course for 521071A Principles of Semiconductor Devices.

Recommended or required reading:

Lecture notes (in Finnish). English material for instance parts from books: H.M. Rosenberg: The Solid State, Clarendon Press, Oxford, 1988 and B. Streetman: Solid State Electronic Devices, Prentice Hall, New Jersey, 1995.

Assessment methods and criteria:

Will be notified in the beginning of lectures.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Will be notified in the beginning of lectures. Read more about assessment criteria at the University of Oulu webpage.

Person responsible:

Juha Hagberg

Working life cooperation:

No

Other information:

-

521071A: Principles of Semiconductor Devices, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Hagberg, Jani Peräntie

Opintokohteen kielet: Finnish

Leikkaavuudet:

521205A	Principles of Semiconductor Devices	4.5 op

ECTS Credits:

5 ECTS credits / 132,5 hours of work

Language of instruction:

Finnish

Timing:

Spring semester period 3

Learning outcomes:

1. will be able to explain physical phenomena in semiconductor materials and junctions; describe main types and characteristics of semiconductor diodes and transistors
2. will be able to explain physical principles of operation and to estimate ideal characteristics of the devices

Contents:

Junctions. Semiconductor diodes and lasers. Bipolar junction transistors. Field effect transistors. Switching devices.

Mode of delivery:

Will be notified in the beginning of lectures.

Learning activities and teaching methods:

Will be notified in the beginning of lectures.

Target group:

Second year electrical engineering students

Prerequisites and co-requisites:

521104P Introduction to materials physics.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes (in Finnish). Book: Streetman, B.: Solid state electronic devices, Prentice-Hall, New Jersey, 2000 (chapters 5 - 8, 11).

Assessment methods and criteria:

Will be notified in the beginning of lectures.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Juha Hagberg

Working life cooperation:

No.

Other information:

-

521431A: Principles of Electronics Design, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Ilkka Nissinen
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Spring, period 3

Learning outcomes:

1. should be able to analyze and design such electronic building blocks as rectifiers, clamping circuits, amplifiers and CMOS logic elements using diodes, operational amplifiers and MOS and bipolar junction transistors.

Contents:

Analogue and digital circuits, basic amplifier related concepts, diodes and diode circuits, single stage bipolar and MOS transistor amplifiers, small signal modeling and analyzing ac properties of amplifiers, internal structures of digital circuits (mainly CMOS), MOS/CMOS switch, operational amplifier.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h and exercises 20 h.

Target group:

Students of Electrical engineering. Other students of the University of Oulu may also participate.

Prerequisites and co-requisites:

Circuit Theory I

Recommended optional programme components:

Recommended course Principles of Semiconductor Devices.

Recommended or required reading:

Lecture notes and Behzad Razavi, “Microelectronics”, 2nd Edition, ISBN 9781-118-16506-5
John Wiley & Sons 2015

Assessment methods and criteria:

Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Juha Kostamovaara

Working life cooperation:

-

521303A: Circuit Theory 2, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Rahkonen, Timo Erkki
Opintokohteen kielet: Finnish
Leikkaavuudet:

521306A	Circuit Theory 2	4.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn, period 2

Learning outcomes:

After the course the student can:
1. use Laplace transform for solving time and frequency response of electric circuits;
2. derive continuous-time transfer functions.;
3. solve their poles and zeros and understand the meaning of those;
4. draw the pole-zero map and Bode plots of any given transfer function;
5. construct 2-port parameter models of a given circuit

Contents:

Use of Laplace transform in network analysis. Properties of network functions, poles and zeros, Boden magnitude and phase plots. 2-port parameter models.

Mode of delivery:

Classroom

Learning activities and teaching methods:

30h lectures, 22 h exercises, and simulation excerices.

Target group:

Finnish BSc students

Prerequisites and co-requisites:

Basics of circuit theory, differential equations.

Recommended optional programme components:

Continuation for Circuit theory 1. Needed in most analog electronics courses.

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 12-18.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical 1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Wireless Communication

031077P: Complex analysis, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Applied Mathematics and Computational Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Kemppainen
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031077P Complex analysis (OPEN UNI) 5.0 op
031018P Complex Analysis 4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

Fall semester, period 1.

Learning outcomes:

After completing the course the student

1. is able to calculate the derivative and the integral of functions of complex variable,
2. understands the concept of analyticity
3. is capable of calculating the contour integrals and using the theory of residues for computing the line integrals, will be able to apply the techniques of complex analysis to simple problems in signal processing.

Contents:

Complex numbers and functions, complex derivative and analyticity, complex series, Cauchy's integral theorem, Laurent and Taylor expansions, theory of residues, applications to signal analysis.

Mode of delivery:

Face-toface teaching, Stack(web-based too) exercises.

Learning activities and teaching methods:

Lectures 28 h/Exercises 14 h/Self study 93 h.

Target group:

The students in the engineering sciences. The other students are welcome, too.

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses Calculus I and II, Differential Equations.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

The lecture notes

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Jukka Kemppainen

Working life cooperation:

-

031080A: Signal Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Kotila, Vesa Iisakki

Opintokohteen kielet: Finnish

Leikkaavuudet:

031050A	Signal Analysis	4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish.
The course can be completed in English by partial exams or by a final exam. The material is available in English.

Timing:

The course is held in the autumn semester, during period II. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

Upon completion of the course, the student:
-is able to calculate the energy, the power, the convolution and the frequency spectrum of discrete and analog, periodic and non-periodic deterministic signals
-is able to calculate the spectrum of a sampled signal
-is able to calculate the Hilbert transform and the complex envelope of a signal
-is able to study the stationarity, the mutual dependence and the frequency content of random signals by means of the auto- and cross-correlation functions, and the power- and cross-power spectral densities
-is able to study the effect of an LTI system on a signal

Contents:

Signals: classification, correlation, convolution, frequency. Fourier analysis: continuous-time and discrete-time Fourier transform, discrete Fourier transform, sampling. LTI system, Hilbert transform. AM- FM- and PM-modulation. Random variable. Covariance matrix. Random signal. Stationarity, autocorrelation. Power spectral density. Random signal in LTI system. Signal estimation.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures 28 h / Exercises 14 h / Self-study privately or in a group 93 h. The independent work includes individual STACK-assignments as online work.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses 031078P Matrix Algebra, 031021P Probability and Mathematical Statistics and 031077P Complex Analysis.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Additional reading: Proakis, J.G., Manolakis, D.K.: Introduction to Digital Signal Processing. Shanmugan, K.S., Breipohl, A.M.: Random Signals, Detection, Estimation and Data Analysis.

Assessment methods and criteria:

The course is completed with two partial exams or a final exam. STACK-assignments given during the course are part of the assessment with partial exams. The assessment of the course is based on the learning outcomes of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Vesa Kotila

Working life cooperation:

-

521330A: Telecommunication Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Heikki Antero Kärkkäinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521357A	Basics of Analog Communications	3.0 op
521361A	Basics of Digital Communications	3.0 op

ECTS Credits:

5 ECTS, equals 125 hours of student’s work

Language of instruction:

Finnish. The course can be completed in other languages e.g. in English as a book examination of specified pages of course book.

Timing:

The course is lectured on period 4. Recommended for second study year.

Learning outcomes:

1. can tell and explain the essential blocks and their operation in time & frequency domains for frequently used analog and digital carrier and pulse modulation methods.
2. understands essential differences both between linear and non-linear modulations, and between coherenr and non-coherent modulations.
3. understands in which system applications each analog or digital modulation is typically used.
4. can tell limitations on system performance caused by noise interference and various transmission channels, and can propose methods to suppress interference both in analog and digital transmission.
5. can perform system analysis, and can calculate performances of analog and digital modulations based on simple assumptions regarding channel models.
6. can compare modulations from the standpoints of resource use (transmitted power and bandwidth needed) and implementation complexity.
7. understands the meanings of various equalizing, diversity and coding methods from the standpoint of improvement for digital transmission reliability.
8. understands various standards and specifications of new digital transmission systems.
9. can apply gained knowledge in working life to design of systems and their sub-system units, and can also perform computer simulations.
10. understands the principles of information theory, source coding and error-control coding, and masters various most commonly used coding methods.

Contents:

Essential and optional blocks of coherent and non-coherent analog and digital transmission systems and their operation principles. Linear (amplitudemodulation) and non-linear (anglemodulation) modulation principles, and differences in their performance and operation. Carrier and pulse modulation principles and their differences. The most important analog (DSB, AM, SSB, VSB, PM, FM, PAM,PWM, PPM) and digital (ASK/MASK, PSK/MPSK, FSK/MFSK, DPSK, QPSK/OQPSK, MSK/GMSK, QAM, MCM/OFDM, TCM, DM, PCM) carrier and pulse modulation methods and their performance analysis (SNR, BEP) and comparison based on the AWGN channel model. Influence of single-tone carrier radiofrequency interference (RFI) in the case of analog modulations. The threshold effect in the case of non-linear modulations and non-linear detectors. Mixing-principle and superheterodyne receiver. Phase-lock loop techniques, and FDM, TDM and QM-multiplexing methods. Matcher filter and correlation receiver principles. Basic characteristics and modelling of radio channels. Influence of band-limiting channel and multi-path propagation: inter-symbol interference (ISI) and fading, and their influence on system performance. Diversity, channel equalizing and MCM/OFDM methods for reducing channel interference. Spread-spectrum technique in brief, and benefits & limitations & applications of that principle. Cellular system idea. Basics of information theory, source coding and error-control coding methods.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Face-to-face teaching 52 h. No separate times for class-ecercises. Exercises are integrated as part of face-to-face teaching event. Self-study 73 h. Total 125 h.

Target group:

Second year B.Sc.(Tech.) students both in electronics and telecommunication engineering, and in computer science and engineering (CSE) degree programmes.

Prerequisites and co-requisites:

031080A Signal analysis course.

Recommended optional programme components:

No connections to other courses.

Recommended or required reading:

Lecture slides in Finnsh are stored into digital learning environment (Optima / Moodle). The course and lecture slides are based on the book: R.E. Ziemer & W.H. Tranter: Principles of Communications: Systems, Modulation and Noise, 7th edition, 2015, John Wiley & Sons, Partially chapters: Ch 1 (ss. 1-16), Ch 3 (112-151), Ch 4 (ss. 156-184, 194-209), Ch 5 (ss. 215-216, 225-239), Ch 8 (ss. 349-361, 370-380, 384-390), Ch 9 (ss. 396-468), Ch 10 (ss. 477-516, 528-532, 540-546, 553-557), Ch 12 (ss. 615-647, 657-664, 668-670, 679-683).

Assessment methods and criteria:

Course can be passed either with four mid-term exams, or with final exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Read more about assessment criteria at the University of Oulu webpage.

Person responsible:

Kari Kärkkäinen

Working life cooperation:

No

Other information:

This course replaces the following candidate level courses: 521357A Telecommunication Engineering I (3 ECTS) and 521361A Telecommunication Engineering II (3 ECTS).

521329A: Hands-on Course in Wireless Communication, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Heikki Antero Kärkkäinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521316A	Introduction to Broadband Transmission Techniques	4.0 op

ECTS Credits:

5 ECTS, equals 125 hours of student's work

Language of instruction:

Finnish

Timing:

The course is organized in the autumn semester during 1. period. It is recommended to complete the course at the 3rd year autumn semester.

Learning outcomes:

After completing course a student

1. is acquainted with the principles of universal software radio peripheral (USRP) technologies and their implementation. That is obtained with the aid of small laboratory exercise work tasks which require understanding theories of basic analog and digital carrier modulation methods.
2. understands the idea of complex-valued I&Q vecor-signals, which exist behind software radios and measurement techniques.
3. has learned how to use universal software radio peripheral transceivers, and how to observe them in laboratory environment. Student also understands how to control these FGPA-based (field-programmable gate array) devices with the aid of control software platforms (e.g. Matlab-Simulink, LabVIEW, GNU Radio) and understands their limitations.
4. has implemented and tested various basic modulation methods both in radio channel and coaxial cable channel, and has made real observations and measurements in time-frequency domain using USRP control software.
5. has learned to find and deduct radio signal spectras and time waveforms with the aid of time-frequency analysis.
6. can test and model in laboratory environment during course and later in work life various problems and solutions dealing with wireless communication before construction of a prototype device.

Contents:

Students are introduced to the wireless communication systems and their phenomena with the aid of guided laboratory exercises. The course utilizes National Instruments USRP-2900 universal software radio peripheral tranceiver. Also other radio platforms and IoT equipments may be utilized.

Mode of delivery:

Face-to-face teaching and guided laboratory exercises in a class. Self-studying at home between work themes. Writing of exercise work report for each conducted work task.

Learning activities and teaching methods:

Course consist of small wireless communication tasks using various analog and digital carrier modulations. Total number of exercise works is 7. The course utilizes mainly National Instruments USRP-2900 universal software radio peripheral tranceiver which is controlled via laptop computer's USB connection. Transmission and receiving of I&Q signals are controlled with Matlab. Students are required to have competent laptop with Matlab-Simulink campus licence. If necessary, students have to participate in short briefing lectures, in addition to get instructions for each exercise work. Exercises are done by a group of 2 students. Results are summarized in a written report for each task according to given instructions. Students have to retun report two weeks after each work session.

Course contains 14 hours lectures for work instructions and 28 hours of measurement work. In addition, students perform 83 hours of self-study and reporting at home. Total 125 hours.

Target group:

Third year bachelor level electrical engineering students.

Prerequisites and co-requisites:

031080A Signal analysis and 521330A Telecommunication engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

No course book. Lecture slides, and problem assignments together with work instruction are given during the course. Materials will be placed into TTK-Optima environment. In addition, some NI USRP-2900 related material will be placed into Optima. Some materials and links can be found also from the Noppa page: https://noppa.oulu.fi/noppa/kurssi/521329a/etusivu

Assessment methods and criteria:

All students of a group have to participate in introductory face-to-face teaching and briefing lecture, and will prepare a final report according teacher's instructions. Before student's mandatory absence, a student has to negotiate that with a teacher. Participation in all introductory lectures and laboratory exercises is mandatory for all members of a group. Presence of each student is monitored by a teacher. In addition, final report has to be in form required by a course teacher, and the content has to be satisying from acceptance standpoint. Course does not contain final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

For each exercise work grading is done with the numbers 0…5. Grade 0 is interpreted as failed. Each work must have at least grade 1. Final grade is an average of sub-tasks with standard rounding technique.

Person responsible:

Kari Kärkkäinen

Working life cooperation:

No

Other information:

-

521337A: Digital Filters, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Olli Silven

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521337A	Digital Filters (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish, English study material available

Timing:

Spring, period 3.

Learning outcomes:

1. Student is able to specify and design respective frequency selective FIR and IIR filters using the most common methods.

2. Student is able to solve for the impulse and frequency responses of FIR and IIR filters given as difference equations, transfer functions, or realization diagrams, and can present analyses of the aliasing and imaging effects based on the responses of the f

3. Student is able to explain the impacts of finite word length in filter design.

4. Student has the necessary basic skills to use signal processing tools available in Matlab environment and to judge the results.

Contents:

1. Sampling theorem, aliasing and imaging, 2. Discrete Fourier transform, 3. Z-transform and frequency response, 4. Correlation and convolution, 5. Digital filter design, 6. FIR filter design and realizations, 7. IIR filter design and realizations, 8. Finite word length effects and analysis, 9. Multi-rate signal processing.

Mode of delivery:

Face-to-face teaching (Lectures), independent work, group work

Learning activities and teaching methods:

Lectures and exercises 50 h. The design exercises familiarize the students with the methods of digital signal processing using the Matlab software package. The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

031077P Complex Analysis, 031080A Signal Analysis

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes and exercise materials. Material is in Finnish and in English. Course book: Ifeachor, E., Jervis, B.: Digital Signal Processing, A Practical Approach, Second Edition, Prentice Hall, 2002.

Assessment methods and criteria:

The course can be passed either with week exams or a final exam. In addition, the exercises need to be returned and accepted.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Olli Silven

Working life cooperation:

None.

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440146: Module Preparing for the Major, Medical and Wellness Technology, 40 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Module Preparing for the Option

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Biomedical Engineering

080901A: Introduction to Technology in Clinical Medicine, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: Finnish

Status:

-

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

Finnish

Timing:

Bachelor or Master studies, autumn term, 1^{st} and 2^{nd} periods

Learning outcomes:

The student can identify technologies in different fields of clinical medicine, can describe operating principles behind these technologies and evaluate the advantages and limitations of the technologies.

Contents:

Course introduction lectures. Specialists from different clinical areas give lectures and demonstrations, in which main themes and terms of the field are introduced and technical methods and development needs are presented.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Initial exam. Lectures, demonstrations, course assignment and self-study. Final exam which is based on lectures and all given materials.

Target group:

Students of medical and wellness technology, information technology, electrical engineering, mechanical engineering, industrial engineering and management, physics or of other related degree programmes interested in biomedical engineering and medical technologies.

Recommended optional programme components:

The course is independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

T. Sora, P. Antikainen, M. Laisalmi, S. Vierula: Sairaanhoidon teknologia, WSOY 2002.
P. Pölönen, T. Ala-Kokko et al.: Akuuttihoidon laitteet, Duodecim 2013. Available as an e-print: http://www.terveysportti.fi/dtk/aho/koti
The material addressed during the lectures.

Assessment methods and criteria:

Initial exam with multiple-choice questions. Taking part in the lectures and demos. Learning assignment. Final exam, which includes essays. Before participation in the final exam, the student must complete and pass the initial exam and learning assignment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5 or fail. Grading is based on the final exam.

Person responsible:

Professor Timo Jämsä

Working life cooperation:

The course will be mainly organized in the hospital, and lectures are given by clinical specialists.

764163P: Introduction to Biomedical Physics, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Kyösti Heimonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

764163P-01	Basic biophysics (part 1): Introduction to biophysics	0.0 op
764163P-02	Basic biophysics (part 2)	0.0 op
764103P	Introduction to biophysics	2.0 op
764162P	Introduction to biophysics	3.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

1st spring

Learning outcomes:

Student can describe and explain some basics and concepts of certain areas of biomedical physics and knows central research targets and methods of biomedical physics.

Contents:

The course provides an introdution to biomedical physics from the point of views of biosciences and medical physics, and introduces basics of research and recording methods of the field, biophysical models, biosystems analysis, cellular and biomolecular physics, physics of fluids and their flow, and some other special issues. The course includes also a short introduction to some fields of physics that are of particular and occupational interest to medical physicists.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 36 h, self-study 96 h, final exam

Target group:

Mainly students in Physics B.Sc. program.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Lectures and lecture notes

Assessment methods and criteria:

Exam

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kyösti Heimonen

Working life cooperation:

No work placement period.

521109A: Electrical Measurement Principles, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Saarela
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 136h

Language of instruction:

Course is lectured in Finnish. Lecture notes are available in English. Laboratory exercises and the exam can be done in English.

Timing:

Periods 1-2.

Learning outcomes:

1. is able to measure basic measurements with a multimeter,

2. is able to measure basic measurements with an oscilloscope,

3. is able to operate signal and function generators.

4. is able to estimate the validity of their measurements.

Contents:

Units of measures, standards of measures, analysis of errors, most commonly used analog and digital measuring methods, equipment and electrical safety regulations.

Mode of delivery:

Pure face-to-face teaching.

Learning activities and teaching methods:

Lectures 20h, laboratory exercises 16 h and self-study 100h.

Target group:

Course is compulsory for electrical engineering, information engineering and wellness technology students. Course is open for all students in University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

None.

Recommended or required reading:

Course material is in English and Finnish and can be found in Optima.

Assessment methods and criteria:

Exam and passed lab exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grade is based on exam and grade is on numerical scale 1-5.

Person responsible:

Juha Saarela

Working life cooperation:

None.

Other information:

-

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Miika Nieminen, Kyösti Heimonen
Opintokohteen kielet: English

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

English

Timing:

Master studies, spring term 2020, 4^{th} period

Learning outcomes:

The student is able to define human anatomy and describe the physiological functions, and can explain how these can be investigated using different imaging methods and measurement systems

Contents:

The course acquaints the student to human physiology and anatomy. Areas covered include
Cells and tissues,
Skin, blood, blood circulation and the fluids of the body
Musculoskeletal organs
Defense reactions of the body
Respiration
Digestion
Urine secretion
Metabolic regulation, heat regulation
Reproduction
Sensory functions
Nervous system

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28h, demonstrations 6h. Independent studying 101h. Final examination.

Target group:

Biomedical engineering and physics students

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. Imaging methods are more closely studies in the course 080920S Diagnostic Imaging.

Recommended or required reading:

Students will be informed about the supplementary reading in the beginning of the course.

Assessment methods and criteria:

Mandatory parts of the course: participation in demonstrations, passing the final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1- 5. In the numerical scale zero stands for a fail. Course grade is based on score of the final exam

Person responsible:

Professor Miika Nieminen

Working life cooperation:

Demonstrations will be held in hospital environment and are related to diagnostics.

Other information:

Maximum number of participants is 40 students

031077P: Complex analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kemppainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031077P	Complex analysis (OPEN UNI)	5.0 op
031018P	Complex Analysis	4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

Fall semester, period 1.

Learning outcomes:

After completing the course the student

1. is able to calculate the derivative and the integral of functions of complex variable,
2. understands the concept of analyticity
3. is capable of calculating the contour integrals and using the theory of residues for computing the line integrals, will be able to apply the techniques of complex analysis to simple problems in signal processing.

Contents:

Complex numbers and functions, complex derivative and analyticity, complex series, Cauchy's integral theorem, Laurent and Taylor expansions, theory of residues, applications to signal analysis.

Mode of delivery:

Face-toface teaching, Stack(web-based too) exercises.

Learning activities and teaching methods:

Lectures 28 h/Exercises 14 h/Self study 93 h.

Target group:

The students in the engineering sciences. The other students are welcome, too.

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses Calculus I and II, Differential Equations.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

The lecture notes

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Jukka Kemppainen

Working life cooperation:

-

031080A: Signal Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Kotila, Vesa Iisakki

Opintokohteen kielet: Finnish

Leikkaavuudet:

031050A	Signal Analysis	4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish.
The course can be completed in English by partial exams or by a final exam. The material is available in English.

Timing:

The course is held in the autumn semester, during period II. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

Upon completion of the course, the student:
-is able to calculate the energy, the power, the convolution and the frequency spectrum of discrete and analog, periodic and non-periodic deterministic signals
-is able to calculate the spectrum of a sampled signal
-is able to calculate the Hilbert transform and the complex envelope of a signal
-is able to study the stationarity, the mutual dependence and the frequency content of random signals by means of the auto- and cross-correlation functions, and the power- and cross-power spectral densities
-is able to study the effect of an LTI system on a signal

Contents:

Signals: classification, correlation, convolution, frequency. Fourier analysis: continuous-time and discrete-time Fourier transform, discrete Fourier transform, sampling. LTI system, Hilbert transform. AM- FM- and PM-modulation. Random variable. Covariance matrix. Random signal. Stationarity, autocorrelation. Power spectral density. Random signal in LTI system. Signal estimation.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures 28 h / Exercises 14 h / Self-study privately or in a group 93 h. The independent work includes individual STACK-assignments as online work.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses 031078P Matrix Algebra, 031021P Probability and Mathematical Statistics and 031077P Complex Analysis.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Additional reading: Proakis, J.G., Manolakis, D.K.: Introduction to Digital Signal Processing. Shanmugan, K.S., Breipohl, A.M.: Random Signals, Detection, Estimation and Data Analysis.

Assessment methods and criteria:

The course is completed with two partial exams or a final exam. STACK-assignments given during the course are part of the assessment with partial exams. The assessment of the course is based on the learning outcomes of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Vesa Kotila

Working life cooperation:

-

041201A: Basics in eHealth, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Jarmo Reponen

Opintokohteen kielet: English

Leikkaavuudet:

ay041201A	Basics in eHealth (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

English
(native Finnish speakers are allowed to write their essay in Finnish)

Timing:

The main course for students of the (Master´s) degree programmes is held in the spring semester, 3rd period. This course is meant also for exchange students of the Biomedical Engineering programme

The special edition course is held for exchange students of the Faculty of Medicine (medicine, health sciences) in the autumn semester, 2nd period. Other students can participate in this course depending on availability of free places (limited number of places).

Learning outcomes:

Upon completion of the course:
The student can define central information and communication technology (ICT) terms and solutions in healthcare, and can list respective applications in healthcare services and training.
The student can evaluate the societal and economic significance of information and communication technology in healthcare
The student can understand the position of e-health and telemedicine solutions as a part of the national health care information system.
The student receives an initial view of future health ICT trends from clinical perspective and possibilities to contribute to these with his/her professional background

Contents:

Terms and concepts
- societal dimensions
- delivery of health services
- electronic patient records
- data transfer within the health care system
- data transfer between the health care professionals and the patients
- citizens providing their own health data, mHealth-solutions
- national healthcare information exchange in Finland
- remote consultations, examples like teleradiology, telepsychiatry, telerehabilitation
- economical and functional assessment
- remote education in health care
- future visions of health care information systems
- changing current topics in connected health like: Artificial Intelligence, knowledge based medicine, cybersecurity etc according to availability

Mode of delivery:

Web-based teaching

Learning activities and teaching methods:

Interactivity takes place in virtual learning environment Optima or Moodle depending availability during the course. The course consists of videotaped lectures, power point presentations and links to other material available in the web. Performance of duties includes an essay, exam, participating in moderated discussions on the grounds of the lectures.
Web lectures 15h / Web exam 40h / Written essay 40h* / Self-study and participation in web discussion 40h
(*Exchange student can relate their essay to the situation in their home countries)

Target group:

MSc and 3rd year BSc students of Biomedical Engineering and Medical & Wellness Technology (medical technology, biomedical engineering, biophysics, physics, other degree programs), students of Medicine and Health Sciences and Information technology and everyone who is interested. Please, note the recommended separate course timings for different groups.

Prerequisites and co-requisites:

None

Recommended optional programme components:

The course is independent and does not require additional studies carried out at the same time.

Recommended or required reading:

All recommended or required reading is offered in the virtual learning environment or in linked web pages.

Assessment methods and criteria:

Web tasks, contribution to moderated discussion, an essay and course exams and optional final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0 – 5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Jarmo Reponen
Course teacher Nina Keränen, MD, MSc
Course teacher Anna Maijala MSc

521124S: Sensors and Measuring Techniques, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Aliaksandr Bykau, Alexey Popov
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

English.

Timing:

Period 2.

Learning outcomes:

After the course the student is capable to explain the operating principles of different sensors and can select a right sensor for each measuring target. He/she is able to quantify the requirements that affect sensor selection as well as recognize and evaluate the uncertainty of a measurement. In addition the student is able to plan and design sensor signal conditioning circuits.

Contents:

Methods for measuring displacement, velocity, acceleration, torque, liquid level, pressure, flow, humidity, sound and temperature. Ultrasound, optical and nuclear measurement techniques and applications, material analyses such as pH measurement and gas concentration, pulp and paper measurements and smart sensors.

Mode of delivery:

Pure face-to-face teaching.

Learning activities and teaching methods:

Lectures 26h, exercises 12h and self-study 100h.

Target group:

4 year students.

Prerequisites and co-requisites:

No.

Recommended optional programme components:

No.

Recommended or required reading:

H. N. Norton: Handbook of Transducers, Prentice Hall P T R, 1989 or 2002; lecture and exercise notes.

Assessment methods and criteria:

The course is passed by a final exam and passed exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Aliaksandr Bykau ja Alexey Popov

Working life cooperation:

No.

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440147: Module Preparing for the Major, Software Engineering, 40 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common studies: 521145A or 811177P

521145A: Human-Computer Interaction, 5 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Computer Science and Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Simo Hosio
Opintokohteen kielet: English

ECTS Credits:

5 ECTS cr

Language of instruction:

In English.

Timing:

Autumn, period 2

Learning outcomes:

1. Knowledge of the Human Computer Interaction (HCI) fundamentals
2. Knowledge of evaluation techniques
3. Knowledge of prototyping techniques
4. Knowledge of how HCI can be incorporated in the software development process

Contents:

Human and computer fundamentals, design and prototyping, evaluation techniques, data collection and analysis.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (12 h), exercises (16 h), and practical work (105 h). The course is passed with an approved practical work (several assignments). The implementation is fully English.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

While no specific courses are not required, elementary programming and design skills are desired.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. The course involves some basic programming.

Recommended or required reading:

All necessary material will be provided by the instructor.

Assessment methods and criteria:

The assessment is project-based. Students have to complete several individual exercises throughout the semester: 1: Using questionnaires; 2: Fitts law; 3: Advanced, team-based design exercise and essay. Passing criteria: all exercises must be completed, each receiving more than 50% of the available points. Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Simo Hosio (Dr. Tech.)

Working life cooperation:

If relevant, guest lectures may be organized (optional).

811177P: Humans as Users and Developers of Information Technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tonja Molin-Juustila

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811177P	Humans as Users and Developers of Information Technology (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish.

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course at the 1st autumn semester of the Bachelor's studies.

Learning outcomes:

After completing the course, the student is able to:
* examine humans as both users and developers of information technology,
* explain core concepts of the phenomenon, and understands their meaning in relation to practice, as well as
* describe the background of usability research and some of its scientific theories.

Contents:

The key themes and concepts of the course are the diversity of information technology, humans as users and developers of information technology, usability, use and user experience, user-centred design and service design.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures (24 h), home assignments and written task based on required reading (about 106 h).

Target group:

BSc students.

Recommended or required reading:

Antti Oulasvirta (ed.): "Ihmisen ja tietokoneen vuorovaikutus" (2011), parts I and II. In addition, the material during lectures and other supplementary material.

Assessment methods and criteria:

Home assignments, individual essay, and optional advanced assignment.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Tonja Molin-Juustila

Common studies

811379A: Basics of Human Computer Interaction, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Netta Iivari

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811379A	Basics of Human Computer Interaction (OPEN UNI)	5.0 op
812327A	Introduction to HCI design	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course at the 2nd autumn semester of the Bachelor's studies.

Learning outcomes:

Upon completion of the course, the student will be able to define basic concepts of user interface design, introduce basic design process with design and evaluation methods and tasks, and apply graphical user interface design from the viewpoint of a certain user group and system.

Contents:

Basic concepts of user interface design and usability evaluation; user-centred design process; gathering of user data, analysis, expert evaluation and design by prototyping, user-based evaluation; universal design and user support; user interface description.

Learning activities and teaching methods:

Lectures 20 h, guided group assignment tasks in exercises 21 h and without guidance in assignment groups 58 h; seminar 3 h; individual tasks 31 h.

Target group:

BSc students.

Prerequisites and co-requisites:

Humans as Users and Developers of Information Technology (811177P) -course or related knowledge.

Recommended optional programme components:

Recommended or required reading:

Dix et al. (2004, third or later edition) *Human-Computer Interaction* and lecture and assignment materials.

Assessment methods and criteria:

During the course, the students will be compiling the group assignments and individual integration tasks on their implementation. These will be assessed based on the learning outcomes of the course. The assessment criteria and the requirements will be explained in detail during the opening lecture of the course.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Helena Tokkonen

811167P: Introduction to Information Systems Design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Rajanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811167P	Introduction to Information Systems Design (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course in the 2nd spring semester.

The course is held in the spring semester, during period 3. It is recommended to complete the course in the 1st study year.

Learning outcomes:

After completing the course, the student will be able to: Explain the main areas of the information system design on technical level, main design process models for the information system design, basics of the requirement gathering, basics of the information system initialization, and basics of how to evaluate information systems.; Produce use-case descriptions, use-case diagrams and other types of diagrams and descriptions needed to model the operational environment of the information system.

Contents:

Basic concepts of Information Systems, Information System Design, Information System Modeling, Operational Environment Modeling, Process models for Information System Development, Evaluation of Information Systems.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 27 h, exercises 21 h, assignment 85 h, exam 3 h.

Lectures (27h), Exercises (21h), Assignment (85h), Exam (3h).

Target group:

BSc students.

Recommended or required reading:

Satzinger, Jackson ja Burd (2007), Systems Analysis and Design in a Changing World. Hoffer, George and Valacich (2008), Modern systems Analysis and Design, 5. painos.

Assessment methods and criteria:

Exam and mandatory assignment.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Mikko Rajanen

811168P: Information Security, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tero Päivärinta

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811168P	Information Security (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course in the 1st spring semester of the Bachelor's studies.

Learning outcomes:

After completing the course a student is able to
- define essential information security concepts and components of information systems security
- recognize the common types of security threats, and their managerial and technical protection mechanisms
- describe the tasks and responsibilities of information security professionals
- explain the different phases of secure systems development/acquisition
- recognize the fundamental characteristics of risk management and is evaluate information security risks
- recognize basics of technical information security methods and cryptography
- explain areas of behavioral information security research and their practical implications

Contents:

* Basic concepts of information security
* Information security threats, vulnerabilities, and risks
* Legal issues and information security frameworks
* Risk management
* Cryptography
* Information security technologies
* Behavioral information security research

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures and related quizzes or final exam 26 h, weekly assignments and scientific essay 107 h

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Introduction to Information Processing Science as well as Devices and Data Network

Recommended optional programme components:

Recommended or required reading:

Lecture materials, selected articles, and book: Whitman & Mattord (2015). Principles of information security.

Assessment methods and criteria:

Lecture tasks or exam, weekly assignments and essay.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Tero Päivärinta

811391A: Requirements Engineering, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Markus Kelanti

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811391A	Requirements Engineering (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course in the 2nd spring semester of the Bachelor's studies.

Learning outcomes:

Upon completion of the course, the student will be able to:
- Understand the requirements fundamentals
- Apply requirements engineering skills and techniques individually and in teams
- Choose and apply some of the requirements elicitation techniques
- Choose and apply some of requirements specification and documentation techniques
- Apply appropriate requirements validation techniques
- Learn new requirements engineering methods and techniques

Contents:

* Requirements traceability
* Different stakeholder viewpoints and requirement categories
* Requirements change
* Problem structuring methods
* Requirements engineering skills and techniques in iterative development environment
* Requirements identification, elicitation, specification and documentation techniques
* Requirements prioritization and validation techniques

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures and exercises 32 h; independent work, weekly assignments and group project 101 h.
Alternatively, independend study and book exam 133 h.

Target group:

B.Sc. students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished:
Introduction to Software Engineering

Recommended optional programme components:

Recommended or required reading:

Wiegers, Karl & Beatty, Joy (2013). Software Requirements, 3rd Edition.

Assessment methods and criteria:

Active participation (lectures, weekly assignments and group project), or alternatively book exam

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Markus Kelanti

Common: 521457A tai 811346A

521457A: Software Engineering, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521457A	Software Engineering (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

Finnish. Material available in English.

Timing:

Spring, period 3.

Learning outcomes:

1. After finishing the course, the student knows the basic concepts of software engineering
2. The student also knows the different areas of project management, the phases of software development
3. The student can defines goals and tasks for each phase of development
4. The student knows the principles of secure software development
5. The student knows the metrics used in software engineering and is able to apply them
6. The student is familiar with tools commonly used in software engineering.

Contents:

Problematics of software development and the special features of real-time systems in this regard. Software development is viewed in regard to project management and actual implementation: 1. process models, 2. requirements specification, 3. project management basics: design, metrics, risk management, resource management, follow up, quality control, product control, 4. software testing methods and strategies, 5. introduction to object-oriented analysis and design. 6. Agile software development. 7. Secure software engineering

Mode of delivery:

Face-to-face or online course

Learning activities and teaching methods:

The course consists of lectures and independent practical exercises. The course is completed by a final exam or learning diaries and successfully completed practical exercises. Lectures 30 h, laboratory design (in period 3) 8 h, the rest of the self-study.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521286A Computer Systems or 521142A Embedded Systems Programming.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

R.S. Pressman: Software Engineering - A Practitioner's Approach. Eight Edition. McGraw-Hill 2010. Older editions (6. and 7.) can also be used with some additional material.

Assessment methods and criteria:

Final exam and accepted laboratory exercise.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Juha Röning

Working life cooperation:

-

811346A: Software Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Lappalainen, Jouni Esko Antero

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course in the 2nd study year.

Learning outcomes:

After completing the course, a student
- is able to explain various aspects of software engineering areas such as process models, requirement specification, analysis and design methods, quality management and project management, their importance and know how to use them for small-scale task solving
- is familiar with software engineering practices and activities (review, testing, software product management, risk management, project management) and knows how to use them in software development at different levels
- can explain the maintenance and redesign of software evolution and its importance.

Contents:

Software process, software requirements, software design methods, software engineering practices, software quality management, software project management.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (in Finnish) 32 h, exercises 24 h, study group working 40 h (or alternatively essay 60 h) and self-study 24 h.

Target group:

BSc students.

Prerequisites and co-requisites:

Course Introduction to Information Systems Design and Object Oriented Analysis and Design or similar knowledge.

Recommended or required reading:

Pressman R., Software Engineering, A Practitioner's Approach, 7 th edition, McGraw-Hill, 2010, lecture material

Assessment methods and criteria:

Essay and assignment, or study group work and assignment.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Jouni Lappalainen

Working life cooperation:

A guest lecture by an industry representative, where he discusses his work and some aspect of software engineering in it. The intent is that the representative is a dept. alumnus.

Software production

811174P: Introduction to Software Business, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Marianne Kinnula

Opintokohteen kielet: Finnish

Leikkaavuudet:

811178P	Technology Business and Innovations	5.0 op
ay811174P	Introduction to Software Business (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course at the 1st spring semester of the Bachelor's studies.

Learning outcomes:

After completing the course, a student can:
• Explain how the industry is structured;
• Describe the software industry's business logic as typically used in business models and the reasoning behind their use;
• Describe the important areas of the software business;
• Describe legal issues related to software business

Contents:

This course provides an overview of software business from three different viewpoints: software industry, business logic, and functions of a software company.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Blended teaching 100 h, home essay 30 h

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Introduction to Information Processing Science

Recommended optional programme components:

-

Recommended or required reading:

Course material and related literature.

Assessment methods and criteria:

Assignments, take home examination.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Marianne Kinnula

811104P: Programming 1, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Räsänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811104P	Programming 1 (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 1st autumn semester of the Bachelor's studies.

Learning outcomes:

After completion of this course, the student is able to:
- Create simple working programs
- Identify basic control structures and use them in the program.
- Identify the concepts of modularity, table, storage of information, and use them in the program.
- Find and fix errors in the program.
- Solve a computational problem by using abstraction and stepwise refinement
- Explain the concept of recursion.
- Operate with binary and hexadecimal number systems, as well as knows the presentation of numbers on a computer.
- Document the program.

Contents:

1. Software design method (waterfall) 2. Problem solving 3. Stepwise refinement 4. Control structures 5. Modular programming, calling modules, communication between modules 6. Data types 7. Arrays 8. Pointers 9. Character strings 10. Data structures 11. Storing data.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lecture (in Finnish) 40 h, exercises 24 h, self-study 70 h

Target group:

BSc students

Recommended or required reading:

Deitel, Deitel: C HOW TO PROGRAM;
Pearson Education Inc. 2007, or a newer edition.
Lecture slides.

Assessment methods and criteria:

1. Final exam and exercise points and programming assignment. OR 2. Mid-term exams (2) and exercise points and home programming assignment.

Grading:

Numerical scale 1-5 or fail

Person responsible:

Ilkka Räsänen

Information Systems

815345A: Software Architectures, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juustila, Antti Juhani

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 3rd spring semester of the Bachelor's studies.

Learning outcomes:

The goal of the course is to give the students an overview of the concepts and techniques related to software architectures. The focus of the architectural solutions is in the object oriented systems, but the course addresses also generic architectural models and techniques supporting architectures. After the course, the student is able to identify and analyse different architectural solutions and understands the pros and cons of these, from the perspective of building and running software, as well as from the viewpoint of quality and maintainability. The student is able to describe architectural solutions and elements of these, as well as different interfaces, using the modeling techniques of UML. The student is able to create alternative architectural solutions based on functional and non-functional requirements, using different design methods and techniques of architectural design, as well as evaluate the solutions' fit to use. The student is able to differentiate the design of product and product family architectures from the design of more usual software architectures.

Contents:

The fundamentals of software architectures. Documenting software architectures. Components and interfaces, Software dependencies. Design patterns. Architectural styles. Product line architectures. Frameworks, Evaluation methods of software architectures.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 24 h, exercises 20 h, exercise work as group work 90 h.

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Data Modeling and Design

Recommended or required reading:

Robert Hanmer: Pattern-Oriented Software Architecture For Dummies, 2013; K. Koskimies, T. Mikkonen: Ohjelmistoarkkitehtuurit. Talentum 2005; L. Bass, R. Clements, R. Kazman: Software Architecture in Practice. Addison-Wesley 2003; Other material mentioned in the course.

Assessment methods and criteria:

The evaluation of the course is based on the learning outcomes of the course. The course is passed by participating in the course assignments as well as by evaluation of the exercise work. Detailed evaluation principles are announced in the wiki page of the course.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Antti Juustila

Working life cooperation:

Guest lectures

811395A: Basics of Databases, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Iisakka, Juha Veikko

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish. If at least four non-Finnish students take the course, an English exercise group will be organised.

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course in the 1st spring semester.

Learning outcomes:

After completing the course, students will understand what the databases are and what are their relevance to information systems. They know the concept model for building databases, design a relational database with a good quality and make queries. Students understand the transactions, schedules, serialiseability and recovery options.

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Contents:

Conceptual modelling (ER- and EER-diagrams), relational model (theory, databases, query techniques and normalization), transactions.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 45 h (in Finnish), compulsory exercises 24 h, reading 20 h, exams 21 h and self-studying 23 h.

Target group:

BSc students.

Prerequisites and co-requisites:

The student knows basics of programming.

Recommended or required reading:

Silberschatz, Korth & Sudarshan: Database system concepts. Elmasri & Navathe: Fundamentals of database systems.

Assessment methods and criteria:

The course is divided to five parts. All parts must be passed in a year. Students must show they achieve at least half of required knowledge of each part.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Juha Iisakka

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440148: Module Preparing for the Major, Information Engineering, 40 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Module Preparing for the Option

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521160P: Introduction to Artificial Intelligence, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Computer Science and Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Olli Silven
Opintokohteen kielet: English
Leikkaavuudet:

ay521160P	Introduction to Artificial Intelligence (OPEN UNIV)	5.0 op

ECTS Credits:

5 ECTS credits /135 hours of work

Language of instruction:

The language of instruction is Finnish with part of the material in English. The course is implemented as exercises done by groups of participants.

Timing:

The course is held during the period IV in the Spring semester, and it is recommended for the 1st or 2nd year.

Learning outcomes:

Upon completion the student the student will have the elementary skills to identify the potentially applicable artificial intelligence techniques for solving problems. He/she is able to recognize search, regression, classification, and clustering problems, and to explain the use of supervised and nonsupervised learning, performance measurements and metrics.

Contents:

1. Introduction: the role of artificial intelligence
2. Search methods: artificial intelligence in games
3. Regression methods: learning of causalities
4. Classication methods: recognition of categories
5. Clustering methods: identification of category structure
6. Supervised learning
7. Unsupervised learning

Mode of delivery:

The course is implemented face-to-face teaching

Learning activities and teaching methods:

Lectures 42h / group work 70 h / elf-study 23 h. The exercises are completed as group work in multi-disciplinary teams.

Target group:

The course is suitable for all students, but due to the nature of the exercises some elementary programming skills are needed in each student group.

Prerequisites and co-requisites:

No prerequisites

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

The course is modeled loosely based on the University of Washington’s Coursera module “Machine learning foundations: a case study approach”

Assessment methods and criteria:

The course utilizes continuous assesment. During the course there are 6 intermediate exams of which 5 best ones will be used in final evaluation. The course includes 5 group exercises of which at least 4 need to be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Olli Silvén

Working life cooperation:

The course includes guest presentations on the artificial intelligence applications

521287A: Introduction to Computer Systems, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Leppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521287A	Introduction to Computer Systems (OPEN UNI)	5.0 op
521142A	Embedded Systems Programming	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Lecturing in Finnish, course and exercise material available in English.

Timing:

Autumn, periods 1-2.

Learning outcomes:

Upon completing the course, the student understands the basics of computer architecture and CPU operation.
Student knows number systems and data representations in computer.
Student is familiar of I/O operation with peripheral devices.
Student is able to implement small programs with the C programming language for workstations and embedded systems.
Student recognizes how embedded systems programming is different from programming general-purpose computers.

Contents:

Overview of computer architecture and CPU, data types and memory management, interrupts, registers and I/O, general computer and embedded systems programming, basics of the C programming language.

Mode of delivery:

Web-based teaching + face-to-face teaching.

Learning activities and teaching methods:

Lectures (16h), course exercises (10-20h), laboratory exercise (3h) and course project in a group.

Target group:

Students of the University of Oulu

Prerequisites and co-requisites:

Elementary programming 521141P

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes and exercise material are available in the course website. For English speaking students, either of the following material may be useful:
Patterson & Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5th Edition, Chapter 1.
Bryant & O'Hallaron, Computer Systems: A Programmer's Perspective, 3rd Edition, Chapter 1.

Assessment methods and criteria:

The assessment criteria is based on the learning outcomes of the course. Students complete the course exercises, participate to the laboratory exercise and complete the course project in a group. Assessment is based on the exercises and the course project. More detailed information on assessment is published in the lecture material.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Teemu Leppänen

Working life cooperation:

Visiting lectures with experts from local industry are possible.

Other information:

This course replaces the course 521142A Embedded systems programming.

Artificial Intelligence

805305A: Introduction to Regression and Analysis of Variance, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Päkkilä

Opintokohteen kielet: Finnish

Leikkaavuudet:

806112P	Basic Methods of Data Analysis	10.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Autumn term, 2nd period. Recommended to be taken already in the 2nd year for those aiming at specialization in data science.

Learning outcomes:

Upon successful completion of the course the student can describe the basic concepts and main principles of regression and variance analysis with one or several explanatory variables, and is able to apply these methods in analysing a small scale data set as well as to apply the necessary computational tools.

Contents:

Linear regression and analysis of variance models for continuous outcomes; Formulation of the model and interpretation of parameters; Fitting the models, estimation of parameters, and prediction with the method of least squares: Basic methods of model criticism and diagnostics; Use of R environment in modelling.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Lectures 28 h, practicals 14 h, and independent work. The practicals include both homework and computer class exercises.

Target group:

Students of mathematical sciences and other interested. The course belongs to core studies for those with an orientation to data science. It is a prerequisite for those doing M.Sc. in computational mathematics and data science having data science as the specialization profile. The course is useful also for students of the Faculty of Science and the Oulu Business School as well as those of computer science or computational engineering, who have statistics as a minor subject.

Prerequisites and co-requisites:

806113P Introduction to Statistics or 806119P A Second Course in Statistics or corresponding abilities acquired otherwise.

Recommended optional programme components:

Is assumed as preliminary knowledge in the course 805306A Introduction to Multivariate Methods.

Recommended or required reading:

Lecture notes and material distributed during lectures and practicals. Recommended reading:James, G., Witten, D., Hastie, T., Tibshirani, R. (2013). An Introduction to Statistical Learning with Applications in R}. Springer, New York; chapters 1-3. -- freely downloadable from http://www-bcf.usc.edu/~gareth/ISL/

Assessment methods and criteria:

Practical exercises and final exam. Passing the course requires adequate participation in practical sessions and sufficient homework activity.

Grading:

Numeric assessment scale from 1 to 5

Person responsible:

Jari Päkkilä

Working life cooperation:

No

521495A: Artificial Intelligence, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay521495A	Artificial Intellig (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

English

Timing:

Period 3.

Learning outcomes:

1. is able to identify the types of problems that can be solved using methods of artificial intelligence.

2. knows the basic concepts of intelligent agents, the common search methods used in artificial intelligence, logic based reasoning and applying planning techniques to problems of artificial intelligence.
3. can also apply simple methods to reasoning under uncertainty and machine learning from observation.
4. In addition the student will be able to implement the most common search methods.

Contents:

1) Introduction, 2) Rational (Intelligent) Agents and Uninformed Search, 3) Informed Search, 4) Programming Project 1 (Pacman 1), 5) Adversarial Search (Games), 6) Programming Project 2 (Pacman 2), 7) Uncertainty and Utilities, 8) Markov Decision Processes, 9) Reinforcement Learning, 10) Bayesian Networks, 11) Machine Learning (learning from Observation), 12) Advanced Applications, 13) Conclusions

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

28 hours of lectures and a programming exercise (approximately 25 hours) during period 3, the rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Programming skills.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

The course material is based on the Artificial Intelligence course of Berkely University and the book "Artificial Intelligence, A Modern Approach" by Russell & Norvig.
1) http://ai.berkeley.edu/home.html
2) Russell S., Norvig P.: Artificial Intelligence, A Modern Approach, Second Edition, Prentice Hall, 2003.

Assessment methods and criteria:

The course is passed with a final exam and a passed programming exercise.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5 / fail.

Person responsible:

Pekka Sangi and Jaakko Suutala (lecturer)
Mohammad Tavakolian (assistant)

Working life cooperation:

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Other information:

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811395A: Basics of Databases, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Iisakka, Juha Veikko

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish. If at least four non-Finnish students take the course, an English exercise group will be organised.

Timing:

The course is held in the spring semester, during period 3. It is recommended to complete the course in the 1st spring semester.

Learning outcomes:

After completing the course, students will understand what the databases are and what are their relevance to information systems. They know the concept model for building databases, design a relational database with a good quality and make queries. Students understand the transactions, schedules, serialiseability and recovery options.

.

Contents:

Conceptual modelling (ER- and EER-diagrams), relational model (theory, databases, query techniques and normalization), transactions.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 45 h (in Finnish), compulsory exercises 24 h, reading 20 h, exams 21 h and self-studying 23 h.

Target group:

BSc students.

Prerequisites and co-requisites:

The student knows basics of programming.

Recommended or required reading:

Silberschatz, Korth & Sudarshan: Database system concepts. Elmasri & Navathe: Fundamentals of database systems.

Assessment methods and criteria:

The course is divided to five parts. All parts must be passed in a year. Students must show they achieve at least half of required knowledge of each part.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Juha Iisakka

521157A: Introduction to Social Network Analysis, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mourad Oussalah

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 120 hours of works

Language of instruction:

English

Timing:

Period 4. It is recommended to complete the course at the end of period 4

Learning outcomes:

Upon completing the course, the student is expected to i) understand social aspects of the web; ii) learn to collect, clean and represent social media data; iii) quantify important properties of social media; iv) find and analyze (online) communities; v) understand the diffusion process in social network; vi) familiarize with simple modelling toolkits for social media analysis

Contents:

The course describes basics of social network analysis, allowing the students to understand structure and evolution of the network, while enabling them to use appropriate tools and techniques to draw inferences and discover hidden patterns from the network. The course is designed to accommodate computer science, mathematical and social science student background, which helps in emergence of multi-disciplinary research in the university

Mode of delivery:

Face- to-face teaching and laboratory sessions

Learning activities and teaching methods:

Lectures (24 h), tutorial/laboratory sessions (12h), seminar (6 h) and practical work. The course is passed with an approved practical work and class test. The implementation is fully in English.

Target group:

Students with moderate logical reasoning skills

Prerequisites and co-requisites:

None

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

R. Zafarani, M. A. Abbasi, and H. Liu, Social Media Mining: An Introduction, Cambridge University Press, 2014

Assessment methods and criteria:

One class test (30%) in the middle of the term + Project work (70%)
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Mourad Oussalah

Working life cooperation:

-

Other information:

We hope to attract students from humanties, economics and political in order to encourage multidisciplinary studies and enforce interesting student projects where each group contains at least one student from computer science and one from another faculty.

811312A: Data Structures and Algorithms, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ari Vesanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521144A	Algorithms and Data Structures	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish. One English exercise group will be arranged.

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course in the 2nd autumn semester of the Bachelor's studies.

Learning outcomes:

After completing the course the student is able to
- Select a data structure and an algorithm to an application
- Analyze correctness and time complexity of an algorithm implemented in a program
- Apply induction when proving algorithm correctness and define recursive algorithms
- Describe the most common sorting algorithms
- Describe trees, graphs and their basic algorithms, and apply them in a program

Contents:

* Basic data structures
* Analysis of algorithms
* Sorting algorithms
* Hash tables
* Binary search trees
* Graphs and their algorithms
* Algorithm design paradigms

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 48 h, exercises 21 h, exercise work 27 h, independent study 39 h.

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Databases

Recommended optional programme components:

Recommended or required reading:

Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, Second edition, MIT Press 2001 (or newer) and other material defined during the course.

Assessment methods and criteria:

1. Exam and assignment OR 2. Mid-term exams (2) and assignment

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Ari Vesanen

031025A: Introduction to Optimization, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ruotsalainen Keijo

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn, during period 1.

Learning outcomes:

After completing the course the student is able to solve optimization convex optimization problems with the basic optimization algorithms. The student is also able to form the necessary and sufficient conditions for the optimality.

Contents:

Linear optimization, Simplex-algorithm, nonlinear optimization, KKT-conditions, duality, conjugate gradient method, penalty and barrier function methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 14 h / Self-study 93 h.

Target group:

Students in Wireless Communication Engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses Calculus I and II, Matrix algebra

Recommended optional programme components:

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Recommended or required reading:

P. Ciarlet; Introduction to numerical linear algebra and optimization, M. Bazaraa, H. Sherali, C.M. Shetty; Nonlinear programming

Assessment methods and criteria:

The course can be completed by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail

Person responsible:

Keijo Ruotsalainen

Working life cooperation:

-

Other information:

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Computer Science

521145A: Human-Computer Interaction, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Simo Hosio

Opintokohteen kielet: English

ECTS Credits:

5 ECTS cr

Language of instruction:

In English.

Timing:

Autumn, period 2

Learning outcomes:

1. Knowledge of the Human Computer Interaction (HCI) fundamentals
2. Knowledge of evaluation techniques
3. Knowledge of prototyping techniques
4. Knowledge of how HCI can be incorporated in the software development process

Contents:

Human and computer fundamentals, design and prototyping, evaluation techniques, data collection and analysis.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (12 h), exercises (16 h), and practical work (105 h). The course is passed with an approved practical work (several assignments). The implementation is fully English.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

While no specific courses are not required, elementary programming and design skills are desired.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. The course involves some basic programming.

Recommended or required reading:

All necessary material will be provided by the instructor.

Assessment methods and criteria:

The assessment is project-based. Students have to complete several individual exercises throughout the semester: 1: Using questionnaires; 2: Fitts law; 3: Advanced, team-based design exercise and essay. Passing criteria: all exercises must be completed, each receiving more than 50% of the available points. Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Simo Hosio (Dr. Tech.)

Working life cooperation:

If relevant, guest lectures may be organized (optional).

810122P: Computer Architecture, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Räsänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521267A Computer Engineering 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course in the 1st spring semester.

Learning outcomes:

After completing the course, students understand and manage the building blocks of computer architectures, the execution and performance of computer platforms as well as activities related to performance, resource needs, and error situations. Students master the basic vocabulary, which is required in communication and documentation in software development, particularly in the close to device level applications such as embedded software, mobile systems, multimedia and scientific computing.

Contents:

1. Basics of digital logic and components of a processor
2. Formats of digital information
3. The processor and its functions
4. The processor instruction set
5. Assembly language
6. Operating system services
7. Memory management
8. Input and output
9. Interrupts, device drivers and BIOS
10. Multimedia support
11. Mobile processors
12. Parallel computing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 32 h, homework assignments 21 h, laboratory exercises 15 h, examination either through two intermediate exams (preparation 65 h) or through final exam (preparation 65 h).

Target group:

BSc students.

Recommended or required reading:

Comer, D.E., Essentials of Computer Architecture. Pearson/Prentice Hall. ISBN 0-13-106426-7. 2005. 369 s. Luennoilla esimerkkejä kirjoista: Tanenbaum A.S., Structured Computer Organisations. 4 thEdition. Prentice Hall. 1999. 700 s. Stallings, W., Computer Organization and Architecture. 5 th Edition. Prentice Hall. 2000. 768 s.

Assessment methods and criteria:

Active participation and mid-term exams (2) or final exam.

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Ilkka Räsänen.

521301A: Digital Techniques 1, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Lahti

Opintokohteen kielet: Finnish

Leikkaavuudet:

521412A-02	Digital Techniques 1, Exercise Work	0.0 op
521412A	Digital Techniques 1	6.0 op
521412A-01	Digital Techniques, Exam	0.0 op

ECTS Credits:

8

Language of instruction:

Finnish

Timing:

Periods 3-4

Learning outcomes:

1. After the course, students are able to ably binary number system and Boolean algebra in the form of switching algebra to the design and functional analyze of simple digital circuits.
2. In addition, they are also able to use in their designs graphical symbols specified in the dependency notation standard (SFS4612 ja IEEE/ANSI Std.91-1991) and different descriptions of function and structure of state machines.
3. Based on this knowledge, students are able to implement and analyze digital devices consisting of ordinary simple digital components.
4. After having assimilated the basic knowledge of digital technique, students are able to understand also the function and structure of micro controllers and micro processors.

Contents:

The principles of digital devices, Boolean algebra, numeral systems, operating principle, analysis and synthesis of combinational logic, flip-flops, operating principle, analysis and synthesis of sequential logic (state machines), physical characteristics of CMOS technology, registers and register transfers, computer memory, instruction set architecture, computer design basics, interfaces and data transmission.

Mode of delivery:

Classroom

Learning activities and teaching methods:

Fundamentals of digital techniques: Lessons 32h, independent work (homework assignments) 106h, teaching period 3
Fundamentals of computer engineering: Lessons 8h, independent work (homework assignment) 47h, teaching period 3
Project work: Independent work 55h, teaching period 4

Target group:

Primarily 1st year electrical engineering and computer science and engineering BSc students. The course can be taken by the students of the university of Oulu.

Prerequisites and co-requisites:

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Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Textbook: Mano: Logic and Computer Design Fundamentals, MIT OpenCourseWare and execise literature.

Assessment methods and criteria:

Homework assignment and project work.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

Jukka Lahti

Working life cooperation:

No

Other information:

-

521150A: Introduction to Internet, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Erkki Harjula

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

All materials are in English, lectures are given in Finnish.

Timing:

Spring, period 4.

Learning outcomes:

Upon completion of this course, students know and understand the basic concepts, know the key terminology and can write clearly with justifications about the following key areas of the course, which are:

1. The design principles of the Internet, its architecture, functionality and challenges
2. The role of the data link layer and the most important access network technologies
3. The structure and the most important protocols of the TCP/IP protocol stack
4. The most important internet applications and their protocols
5. The basic principles of internet security and multimedia applications

Additionally, students who have attained grades 2 or 3 have demonstrated satisfactory capability to perform practical software implementation work and/or solving Internet-related problems relevant to most centric course key areas. Students who have attained grades 4 or 5 have demonstrated solid capability to perform practical software implementation work and analytical skills for solving technical and research problems relevant to the course key areas.

Contents:

The design principles and architecture of the Internet, data link layer and most important access network technologies, TCP/IP protocol stack and its most important protocols, most important Internet applications, principles of Internet security and multimedia, internet's challenges and Future Internet.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 32h, exercices 16h, laboratory exercises 12h, course work 25h, independent work 48h. Work is done in groups or independently.

Target group:

Computer Science and Engineering students, Information Processing Science students, other students of the University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

None.

Recommended or required reading:

Announced at the beginning of the course.

Assessment methods and criteria:

Passing the course requires mastery of the essential core content of the course. Continuous assessment and exams are provided for students to show that they have attained this level. Higher grades are attained by participating in and completing, either alone or in groups, to non-mandatory exercises and exams on advanced course topics. More detailed information on assessment is published yearly in the lecture material.

Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Erkki Harjula

Working life cooperation:

None.

521159P: Principles of Digital Fabrication, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Georgi Georgiev

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521159P	Principles of Digital Fabrication (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits/ 135 hours of work

Language of instruction:

Finnish/English

Timing:

The course will be held in the spring semester, during period IV.

Learning outcomes:

In this course the students will learn the whole process of digital fabrication in FabLab. They will learn how to create an interactive 3D prototype, design mechanical parts for prototype, create basic electronics, implement a control logic for open hardware embedded board, and work in teams on project.

Contents:

The course teaches students to (1) design mechanical components with solid modeling tools, (2) build necessary electronics, and (3) implement software to a microcontroller, to create in FabLab a physical gadget that interacts with the world around it.

Mode of delivery:

Face-to-face teaching (Lectures)/ Individual work towards project

Learning activities and teaching methods:

Lectures 30h / Individual work 123h. There are sessions each week in FabLab where guidance is available (min total 16 h).

Target group:

This course is included in the computer science bachelor degree program. It is also available for all degree programs in the university. The course is offered to high-school students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

There is no recommended or required reading. The tutorials for tools and software (or links to such tutorials) will be provided in the course.

Assessment methods and criteria:

The course will be evaluated on the basis of the project delivered by the teams of students. Essential part of this reporting is the documentation of the project.

Grading:

pass/fail

Person responsible:

Georgi Georgiev

Working life cooperation:

-

Other information:

The course is also offered to high-school students with special study right and gives 5 ECTS credits that can be included in some bachelor's degrees at University of Oulu.
The exercises are in FabLab:
https://www.oulu.fi/fablab/node/32345

521337A: Digital Filters, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Olli Silven

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521337A	Digital Filters (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish, English study material available

Timing:

Spring, period 3.

Learning outcomes:

1. Student is able to specify and design respective frequency selective FIR and IIR filters using the most common methods.

2. Student is able to solve for the impulse and frequency responses of FIR and IIR filters given as difference equations, transfer functions, or realization diagrams, and can present analyses of the aliasing and imaging effects based on the responses of the f

3. Student is able to explain the impacts of finite word length in filter design.

4. Student has the necessary basic skills to use signal processing tools available in Matlab environment and to judge the results.

Contents:

1. Sampling theorem, aliasing and imaging, 2. Discrete Fourier transform, 3. Z-transform and frequency response, 4. Correlation and convolution, 5. Digital filter design, 6. FIR filter design and realizations, 7. IIR filter design and realizations, 8. Finite word length effects and analysis, 9. Multi-rate signal processing.

Mode of delivery:

Face-to-face teaching (Lectures), independent work, group work

Learning activities and teaching methods:

Lectures and exercises 50 h. The design exercises familiarize the students with the methods of digital signal processing using the Matlab software package. The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

031077P Complex Analysis, 031080A Signal Analysis

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes and exercise materials. Material is in Finnish and in English. Course book: Ifeachor, E., Jervis, B.: Digital Signal Processing, A Practical Approach, Second Edition, Prentice Hall, 2002.

Assessment methods and criteria:

The course can be passed either with week exams or a final exam. In addition, the exercises need to be returned and accepted.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Olli Silven

Working life cooperation:

None.

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440145: Module Preparing for the Major, Mining Technology and Mineral Processing, 40 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Module Preparing for the Option

Laji: Study module

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

491101P: Introduction to mining, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Saija Luukkanen
Opintokohteen kielet: Finnish

Recommended or required reading:

lopputentti, harjoitukset, aktiivisuus

477121A: Particle Technology, 5 op

Voimassaolo: 01.08.2015 - 31.07.2022
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Elisa Koivuranta
Opintokohteen kielet: Finnish
Leikkaavuudet:

477120A	Fluid and Particle Engineering	5.0 op
477101A	Fluid and Particle Engineering I	3.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Implementation in spring term, period 4

Learning outcomes:

Upon completion of the course, a student should be able to identify the mainline mechanical processes in process industry enhancing the degree of upgrading, as well as recovery operations related to those mechanical main processes. The student is able to identify the equipment related to the mechanical processes and can explain their purpose of use and their operational principles.

Contents:

Granular material and sampling, particle size and particle size distribution, specific surface area, basics in grinding, crushing, sieving and mineral concentration, froth flotation, mineral concentration methods based on density difference, magnetic concentration and other concentration methods, granulation, separation from suspensions

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The implementation methods of the course are varying. Lectures and exercises max. 48 h. A part of teaching can be replaced by home or group works or with web learning.

Target group:

Bachelor students in process and environmental engineering

Prerequisites and co-requisites:

Introduction to process and environmental engineering I (477011P)

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures

Assessment methods and criteria:

This course utilizes continuous assessment including two intermediate exams and homework.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

No

477122A: Bulk Solids Handling, 5 op

Voimassaolo: 01.08.2015 - 31.07.2023

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477120A	Fluid and Particle Engineering	5.0 op
477102A	Bulk Solids Handling	4.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Implementation in period 2 (autumn term)

Learning outcomes:

Upon completion of the course, a student should be able to identify auxiliary mechanical unit processes as well as equipment and phenomena related to them. In addition, the student can explain application of unit processes and can describe their operational principles.

Contents:

Liquid and suspensions: fluid mechanics, pumping and hydraulic transport, mixing. Gases and aerodispersions: gas dynamics, compression, pneumatic transport. Granular bulk material: properties, storage, mechanical transportation, fluidization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The implementation methods of the course vary. Lectures and exercises max. 48 h. A part of teaching can be replaced by home or group works or with web learning.

Target group:

Bachelor students in process or environmental engineering

Prerequisites and co-requisites:

477101A Particle Technology

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures

Assessment methods and criteria:

This course utilizes continuous assessment including three intermediate exams with potential web learning, lecture diary and/or homework. Alternatively, the course can also be completed by taking the end exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

No

Other information:

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477401A: Thermodynamic Equilibria, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eetu-Pekka Heikkinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

470611A	Metallurgy Processes	7.0 op

ECTS Credits:

5 cr / 135 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period I. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

Student is capable of defining chemical equilibria of the systems that are related to industrial processes and understands the relevance of equilibria (and their computational determination) as a part of process analysis, planning and control. Additionally, (s)he can define a meaningful system to be considered in computation thermodynamics; i.e. (s)he can create a computationally solvable problem based on technical problem that in itself is not solvable computationally.

Contents:

Concepts of entalphy (H), entropy (S) and Gibbs free energy (G). The effect of temperature and pressure on H, S and G. Chemical and phase equilibria. Activity and activity coefficient. Calculation of thermodynamic equilibria using equilibrium constant as well as Gibbs free energy minimisation.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Lectures (26 hours), software exercises (4 hours) as well as other exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

'Basic Principles in Chemistry' and 'Material and Energy Balances' or corresponding knowledge is recommended as prerequisite.

Recommended optional programme components:

This is one of the courses in which physical chemistry is used in the applications of process and environmental engineering. It is part of a education that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Material will be distributed during lectures and exercises. It is also available via courses www-site.

Assessment methods and criteria:

Students are required to make a portfolio consisting of a learning diary and exercices. Please note that the course is organised only in Finnish.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Eetu-Pekka Heikkinen

Working life cooperation:

There is no direct working life cooperation in this course.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

477221A: Material and Energy Balances, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ahola, Juha Lennart

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477231A	Material and Energy Balances I (OPEN UNI)	2.0 op
ay477232A	Material and Energy Balances II (OPEN UNI)	3.0 op
ay477221A	Material and Energy Balances (OPEN UNI)	5.0 op
477201A	Material and Energy Balances	5.0 op
470220A	Fundamentals of Chemical Process Engineering	5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

Finnish. The course can be completed in English as a book examination.

Timing:

Spring periods 3 and 4.

Learning outcomes:

The student is able to formulate material and energy balances for a process by taking into account the restrictions set by reaction stoichiometry. The student knows how the created mathematical formulation can be exploited in process consideration.

Contents:

Formulation of material and energy balances by taking into account the effects of chemical reactions.

Mode of delivery:

Lectures and group exercise

Learning activities and teaching methods:

Lectures 40h, group work 10h and self-study 80h

Target group:

Bachelor students in of Process or Environmental Engineering

Prerequisites and co-requisites:

High school level chemistry, mathematics and physics.

Recommended optional programme components:

The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Reklaitis, G.V.: Introduction to Material and Energy Balances. John Wiley & Sons, 1983. ISBN 0-471-041319.

Assessment methods and criteria:

During the course, there are two intermediate exams and both of them must be passed. Alternatively student can participate in final exam after the course. In addition to this, the students will be making a group exercise, which will be evaluated.

Person responsible:

Juha Ahola

Other information:

This course replaces the course 477201A Material and Energy Balances, 5 ects.

771113P: Introduction to Geology I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Strand

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay771113P	Introduction to Geology I (OPEN UNI)	5.0 op

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

1st year autumn

Learning outcomes:

Stdents have an understanding of the basic concepts of the Earth, from its composition and internal *structure* to the geological *processes* that has led to its evolution the present Earth as part of the solar system. They can tell how endogenic processes in the mantle and crust produce magmas and how magmas produce different igneous rock type upon emplacement below and on the Earth’s surface. Students are able to recognise and classify common igneous rocks based on their mineral composition and are familiar with common metamorphic rocks and know the metamorphic facies concepts. They can relate deformation and metamorphism of the rocks to plate tectonic processes.

Contents:

Evolution of the Earth as part of the solar system, structure and composition of the Earth. Classification of igneous rocks, magmatism, origin and crystallisation of magmas, volcanism, metamorphism and formation of metamorphic rocks, plate tectonics and deformation structures.

Mode of delivery:

Face to face

Learning activities and teaching methods:

36 h lectures, 6 h exercises

Target group:

1st year geoscience students. The course is a good minor subject course for others.

Prerequisites and co-requisites:

Basic course in mineralogy (771102P) is parallel to this course.

Recommended optional programme components:

This course is intended as an introduction to the scope and methods of igneous and metamorphic petrology.

Recommended or required reading:

Martti Lehtinen, Pekka Nurminen and Tapani Rämö (1998) Suomen kallioperä – 3000 vuosimiljoonaa. Suomen Geologinen Seura, Gummerus Jyväskylä, ISBN 952-90-9260-1, Chapters 2-3. John Grotzinger & Thomas H. Jordan (2010 or 2014) Understanding Earth, 6 th or 7 th edition, Chapters 1-4, 6-7, 9-10, 12.

Assessment methods and criteria:

Written examination and identification test of rock types.

Grading:

5-1/fail

Person responsible:

Kari Strand

Working life cooperation:

No

771117P: Basic course in mineralogy, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

ECTS Credits:

5 ects

Person responsible:

Pekka Tuisku

774311A: A Basic Course in Geochemistry, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS

Language of instruction:

The language of instruction is Finnish. The course can also be completed in English as a book examination.

Timing:

The course is held in the spring semester, during period III. It is recommended to complete the course at the 1st spring semester.

Learning outcomes:

Upon completion of this course, the student will:

have a broad overview of the different fields of geochemistry, be able to relate the behaviour of elements to different physico-chemical processes in nature
be able to convert geochemical data from one form to another (wt.%, molar and cation proportions, milliequivalents)

can plot geochemical data on different diagramscan carry out simple mineral dissolution/precipitation and mass balance calculations.

Contents:

Geochemistry as a field of science; history of geochemistry; tasks and fields of geochemistry; origin and electron configuration of chemical elements; origins and structure of the Earth; meteorites; the geochemical classification of the elements; composition of earth's different spheres; geochemical differentiation; composition of magmas; dissolution and precipitation of minerals; pH-Eh-diagrams; introduction to isotope geochemistry.

Mode of delivery:

Face to face teaching.

Learning activities and teaching methods:

32 h lectures, 12 h exercises.

Target group:

All students in geosciences and mineral processing and mining technology.

Prerequisites and co-requisites:

A basic course in chemistry

Recommended optional programme components:

The course in an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Gill, Robin (1996) Chemical Fundamentals of Geology, Chapman & Hall, London, 298 p. Additional material will be given during the lectures.
You can check the availability of the course book via this link.

Assessment methods and criteria:

Examination in both theory and calculations.

Grading:

The course utilizes a numerical grading scale 1-5. The grade is calculated as the average of the marks of two exams. Zero stands for a fail.

Person responsible:

Eero Hanski

Working life cooperation:

No.

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440141: Module Preparing for the Major, Mechanical Engineering, 40 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common Studies

464101A: Machine drawing and CAD, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Tapio Korpela
Opintokohteen kielet: Finnish
Leikkaavuudet:

464051A Machine Drawing 3.5 op
464051A-01 Machine Drawing, examination 0.0 op
464051A-02 Machine Drawing, excercise 0.0 op
464052A CAD 3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures, Autumn periods 1.-2. Exercises, periods 1. - 2. , and practical work, period 2.

Learning outcomes:

The aim of the course is to teach students to read and to draw machine drawings and to carry out standard specifications of description methods, legends and dimensioning. Students also learn how to use the computer system for modeling and drafting machine parts and assemblies.

Contents:

Purpose of machine drawing; Description and dimensioning of parts; Design and viewpoints of manufacturing; Specifications of welds and surface roughness and tolerances on drawings; Principles of diagrammatic drawings. Machine parts and assemply modeling and making drawings with computer aided design software.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures 30 h / exercises 30 h / computer aided design exercises 20 h / practical work 53 h. Drawing and Modeling exercises will be group exercises and practical work will be individual.

Target group:

1st year mechanical engineering students

Recommended or required reading:

Pere, A.: Koneenpiirustus1 & 2, Kirpe Oy, Espoo. Other literature will be informed on lectures.

Assessment methods and criteria:

Final exam 60%, exercises 30% and practical work 30% of the final grade.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

University lecturer Tapio Korpela

465101A: Introduction to materials for mechanical engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna Kisko

Opintokohteen kielet: Finnish

Leikkaavuudet:

465061A-01 Materials Engineering I, examination 0.0 op

465061A-02 Materials Engineering I, design exercise 0.0 op

465061A-03 Materials Engineering I, laboratory exercise 1 0.0 op

465061A-04 Materials Engineering I, laboratory exercise 2 0.0 op

465061A-05 Materials engineering I, laboratory exercise 3 0.0 op

465061A Materials Engineering I 5.0 op

ECTS Credits:

5 ects/135 hours study time

Language of instruction:

Finnish

Timing:

Lectures and laboratory works, 3 and 4 periods

Learning outcomes:

The aim of the course is to introduce the common physical (metallurgical) phenomena in metal alloys and other construction materials. He/she understands the effect of different microstructural features on the mechanical properites and the processibility of the above mentioned materials. Finally, he/she is familiar with typical non-destructive and destructive testing techniques in material science.

Contents:

Solidification and phase transformations, plastic deformation, static recovery and recrystallization, effect of microstructure on mechanical properties of metal alloys, typical corrosion mechanisms, fatigue in metal alloys, creep in metal alloys, and non-destructive and destructive material testing.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

32 hours lectures/ 12 hours laboratory exercises/91 hours indepedent studies. Three laboratory excersises are included in the course.

Prerequisites and co-requisites:

None

Recommended or required reading:

Lecture booklet (In Finnish). Other material will be announced at the beginning of the course.

Assessment methods and criteria:

Final exam. The final grade is based on the final exam.

Grading:

Numerical grading scale 1 - 5. Laboratory exercises will be graded as "pass"/"fail".

Person responsible:

Olli Nousiainen

463101A: Introduction to manufacturing technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463052A-01 Introduction to Manufacturing Technology, examnation 0.0 op

463052A-02 Introduction to Manufacturing Technology, excercises 0.0 op

463052A Introduction to Manufacturing Technology 5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Timing:

Lectures and exercises periods 3. - 4.

Learning outcomes:

The aim of this course is to give students a general view of manufacturing methods. The primary emphasis of the course is on the cutting methods of metals. Upon completion of the course, the student is able to name the key areas of manufacturing technology and the most important cutting methods. In addition, the student is able to choose the applicable cutting methods and tools for achieving the basic manufacturing tolerances. The student is able to explain the basic features of the most common materials of cutting tools.

Contents:

The course includes 10 hours lectures, an examination and practical exercises of metal cutting in the laboratory.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises

Recommended or required reading:

Ihalainen, E., Aaltonen, K., Aromäki, M., Sihvonen, P.: Valmistustekniikka, Otatieto Oy, Helsinki 2007, 490 s. Supplementary material will be given during the lectures.

Assessment methods and criteria:

Exam and exercises are graded 1-5. Half of the final grade is based on the grade of the exercises and another half of the final grade is based on the grade of the exam.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

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462103A: Introduction to Maintenance, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the most important terms related to the field of maintenance, define what the maintenance is and to tell how it affects on productivity, safety and environment. After the course, the student is able to calculate the most important factors and indicators related to the reliability and classify maintenance actions to corrective and predictive operations. In addition, he/she knows how the maintenance must to take into consideration during different planning tasks.

Contents:

The basic concepts, objectives and effects of the maintenance

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h / group work 20 h / self-study 83 h

Target group:

Bachelor's degree students in the mechanical engineering

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Järviö, J. et al., Kunnossapito. Helsinki, KP-Media Oy / Kunnossapitoyhdistys ry 2007.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462101A: Information technology and machines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain how the information technology is utilized in modern machines. The student is able to describe how the modern machines are developed from purely mechanical systems to multi-disciplinary systems. The student is able to sort out the electrical, information technological and mechanical features of modern machines. He/she is also able to describe the interaction and interfaces of the aforementioned features. In addition to this, the student is able to separate the digital and analog domains. The student is able to create a simple computer program for machine control. He/she is able to name the sensors and actuators being used in automated machines. Furthermore, the student is able to list examples of machines taking advantage of modern information technology.

Contents:

History of mechanical engineering and information technology; Information technology as an enabler of the development of machines; Requirements and boundary conditions for automatisation of machines; Concepts of information technology and electronics; Basics of programming and logical reasoning; Examples of machine applications taking advantage of modern information technology.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 20 h / Group work 12 h / Self-study 101 h

Target group:

Bachelor's degree students of mechanical engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are exercises and intermediate exams. The exercises and the exams will be assessed. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the role of actuators in a typical machine automation system. The student is able to recognize various kinds of actuators and is able to classify them according to performance and usability. In addition to this, the student is able to design a simple hydraulic drive and is he/she is able to select a suitable actuator for a typical automation application. Furthermore, the student is able to assess actuator sensing needs and preconditions to work as a part of automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Yrjö Louhisalmi

Machine Design

461102A: Statics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay461102A	Statics (OPEN UNI)	5.0 op
461016A-01	Statics, examination	0.0 op
461016A-02	Statics, exercises	0.0 op
461016A	Statics	5.0 op

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

Lectures in finnish, foreign students follow the course by reading independently the books in english and taking part to the exercises and exams where all material is given in english.

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

After the course, the student can calculate forces and moments of loaded structures using equations of vector algebra and trigonometry. He/she can draw a free body diagram of the force system and then solve the unknown forces by using equations of equilibrium. He/she can determine resultants from uniformly distributed loads and apply Coulomb's law of friction in the problem equilibrium. The student can solve problems of internal and external forces of particle systems and rigid body systems in case of static equilibrium. Especially, he/she can draw shear force and bending moment diagrams for beam structures.

Contents:

Fundamental laws and concepts in statics. Force systems and their treatment. Equilibrium of particles and rigid bodies. Static forces in isostatic structures such as beams, frames, cables and trusses. Friction.

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

Lectures 55 h / exercises 42 h / independent work of solving homework problems 52 h.

Target group:

Compulsory for candidate degree students of mechanical engineering programme.

Prerequisites and co-requisites:

Now prerequisites required.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T.: Statiikka, Pressus Oy, Tampere 2005; Beer, F., Johnston, R.: Vector Mechanics for Engineers, Statics, McGraw-Hill Book Company, 1996.

Assessment methods and criteria:

In the course acceptable homework and midterm exams / final exam are required. This course utilizes continuous assessment. There are four midterm exams, of which the last one is at the same time a final exam. Homework contain every week three problems that are marked. The student is allowed to participate to a final exam, when the homework is accepted.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Hannu Lahtinen

Other information:

The course gives ability for understanding static equilibrium, ability for determining force balance in structures and readiness for later studies.

461103A: Strength of materials I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

461010A-01	Strength of Materials I, examination	0.0 op
461010A-02	Strength of Materials I, exercises	0.0 op
461010A	Strength of Materials I	7.0 op

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

Lectures in Finnish, foreign students follow the course by reading independently the books in English and taking part to the exercises and exams where all material is given in English.

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 1st spring semester.

Learning outcomes:

After the course, the student can determine stresses and strains of structures under loading. He/she can change the general stress and strain states from one coordinate system to another and can also apply constitutive equations in calculations. The student can dimension typical structures such as tension and compression bars, torsion bars and straight beams.

Contents:

Purpose and goals of strength of materials. Experimental elastic properties and strength of steel. Tension and compression of straight bars. Round torsion bar under shear force and torsion loads. Stresses and deflection curves in straight beams under bending moments. Stress state, strain state and constitutive equations, principal stresses, Mohr's circle. Stress hypotheses.

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

Lectures 55 h / exercises 42 h / independent work of solving homework problems 52 h.

Target group:

Compulsory for Bachelor's degree students of mechanical engineering programme.

Prerequisites and co-requisites:

The recommended preceding course is 461102A Statics.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T., Pajunen, S.: Lujuusoppi, Pressus Oy, Tampere, 2010, Pennala, E.: Lujuusopin perusteet, Moniste 407, Otatieto 2002; Karhunen, J. & al.: Lujuusoppi, Otatieto 2004; Beer, F., Johnston, E., Mechanics of materials , McGraw-Hill, 2011; Gere, J.M., Timoshenko, S.P., Mechanics of Materials, Chapman&Hall, 1991.

Assessment methods and criteria:

In the course acceptable homework and midterm exams / final exam are required. This course utilizes continuous assessment. There are four midterm exams, of which the last one is at the same time a final exam. Homework contain every week three problems that are marked. The student is allowed to participate to a final exam, when the homework is accepted.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Hannu Lahtinen

Other information:

The course looks into the most important principal concepts of strenght of materials and gives ability for dimensioning of simple structures such as straight bars in tension, compression or torsion loads and straight beams under bending moments.

464102A: Design of machine elements, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Korpela

Opintokohteen kielet: Finnish

Leikkaavuudet:

464055A Machine Design I 8.0 op

464055A-01 Machine Design I, examination 0.0 op

464055A-02 Design exercise 0.0 op

464055A-03 Design exercise I, home exercises 0.0 op

462033A Machine Design 7.0 op

ECTS Credits:

10 ects / 267 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures and exercises arranged at autumn periods 1 -2., practical work end of 2 period.

Learning outcomes:

Upon completion of this course, the student will know operating principals, material selection and dimensioning of machine elements. Learning outcomes: Upon completion of this course, the student is able to measure dimensions of the machine elements.

Contents:

Joint elements (screws, welds, etc.); Rotating machine elements (shafts, bearings, clutches, brakes); Power transmission elements (gears, chains, belts, etc.); Basics of needed vibration isolation to ensure smooth operation of machines

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 60 h / exercises 14 h /practical work 120 h / individual studies 73 h.

Target group:

2nd year mechanical engineering student

Prerequisites and co-requisites:

Machine Drawing and CAD

Recommended or required reading:

Airila, M.& al. Koneenosien suunnittelu. Porvoo WSOY, 1995; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983.

Assessment methods and criteria:

Final Exam, homeworks and practical work. Final exam is 50% and practical work 50% of final grade. Homeworks will be graded pass/fail.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

University lecturer Tapio Korpela

464103A: Machine design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464056A	Machine Design II	6.0 op
464056A-01	Machine Design II, examination	0.0 op
464056A-02	Design II, exercise	0.0 op
464062S	Engineering Design	20.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures spring period 3 and 4.

Learning outcomes:

Upon completion of this course, the student is able, asa member of a design group, to design an entire machine, explain material selections and answer for meaning to be responsible of dimensioning of machine elements. Student is also able to design new product or essentially improve old product. Student knows what is required when working as a part of a product development project.

Contents:

Advanced machine design, design of assemplies and design methods. Utilization of Automation and new materials. Meaning of a machine directive.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h / practical work 93 h.

Target group:

3rd year mechanical engineering students

Prerequisites and co-requisites:

Design of machine elements, Machine drawing and CAD.

Recommended or required reading:

Björk, T.& al. Koneenosien suunnittelu. WSOY, Porvoo, 2014; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983. Tuomaala, J. Koneensuunnitteluoppi, first part. Oulu, 1995. Tuomaala, J. : Koneensuunnitteluoppi, later part, Oulu, 1995. Dieter, G.E. : Engineering Design, McGraw-Hill: New York, 2000.

Assessment methods and criteria:

Final Exam and practical work. Final exam is 50% and practical work 50% of final grade

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

Mechatronics

462104A: Machine automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462022S-01 Machine Automation II, examination 0.0 op

462022S-02 Machine Automation II, exercise work 0.0 op

462022S Machine Automation II 5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the basic principles and structures of a typical machine automation system. The student is able to divide an automation system into basic elements and explain their role and significance in the system. The student can apply the basic digital technology and logic methods in designing a typical machine automation system. In addition to this, the student knows the operating principles of programmable logic controllers (PLCs) and is able to implement a logic control for a typical application. Furthermore, the student is able to explain the basic principles of fieldbuses.

Contents:

Basics of automation; Basics of digital technology and logic; Description of operation sequences; Architecture of programmable logic controllers and their programming; Distributed systems and fieldbuses.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. However, it is recommended to complete the course Machine Sensor Technology simultaneously.

Recommended or required reading:

Lecture notes. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Yrjö Louhisalmi

462105A: Machine Sensor Technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462053A	Sensor Technology of Machine Automation	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able identify, classify and bring into use the most common sensor types used in machine automation. The student is able to choose sensors for typical automation applications. In addition to this, the student is able to design a common analog and digital signal transmission and conditioning chain.

Contents:

Basics measuring systems; Classification of sensors; Characteristics of analog and digital domain; Analog to digital conversion; Basics of analog signal conditioning: amplification, attenuation and filtering; Operating principle of digital sensors; Examples of typical sensors used in mechanical engineering and civil engineering;

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p. Chapters 4-7; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

462106A: Precision engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: English

Leikkaavuudet:

462038A-01	Precision Engineering, examination	0.0 op
462038A-02	Precision Engineering, exercise work	0.0 op
462038A	Precision Engineering	3.5 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

English

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 3rd or 4th spring semester.

Learning outcomes:

Upon completion of the course, the student can analyze structures and components used in precise engineering products, can explain working principles of them and can design new qualified and easily manufactured precise engineering products.

Contents:

Introduction, Housing and usability of devices, permanent and detachable joints, bearing and guidance design and on precise and micromechanical manufacturing methods.

Mode of delivery:

Blended teaching. The course is lectured in English, possible exercises are taught face to face. Final exam in English.

Learning activities and teaching methods:

The couse consists of lectures and an exercise work and a final exam.

Target group:

Master's degree students of mechanical engineering

Recommended or required reading:

Lecture notes (in Finnish). Additional literature: Krause, W.: Grundlagen der konstruktion, elektronik, elektrotechnik, feinwerktechnik, 7 aufl., Hanser, 1994; Ullman, D.: The mechanical design process, 3. ed., Mac-Graw-Hill, 2003.

Assessment methods and criteria:

Final exam. The grade of the course is based on a final examination. The student must pass the exercise work before taking the examination.

Grading:

The course utilizes numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Yrjö Louhisalmi

521301A: Digital Techniques 1, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Lahti

Opintokohteen kielet: Finnish

Leikkaavuudet:

521412A-02 Digital Techniques 1, Exercise Work 0.0 op

521412A Digital Techniques 1 6.0 op

521412A-01 Digital Techniques, Exam 0.0 op

ECTS Credits:

8

Language of instruction:

Finnish

Timing:

Periods 3-4

Learning outcomes:

1. After the course, students are able to ably binary number system and Boolean algebra in the form of switching algebra to the design and functional analyze of simple digital circuits.
2. In addition, they are also able to use in their designs graphical symbols specified in the dependency notation standard (SFS4612 ja IEEE/ANSI Std.91-1991) and different descriptions of function and structure of state machines.
3. Based on this knowledge, students are able to implement and analyze digital devices consisting of ordinary simple digital components.
4. After having assimilated the basic knowledge of digital technique, students are able to understand also the function and structure of micro controllers and micro processors.

Contents:

The principles of digital devices, Boolean algebra, numeral systems, operating principle, analysis and synthesis of combinational logic, flip-flops, operating principle, analysis and synthesis of sequential logic (state machines), physical characteristics of CMOS technology, registers and register transfers, computer memory, instruction set architecture, computer design basics, interfaces and data transmission.

Mode of delivery:

Classroom

Learning activities and teaching methods:

Fundamentals of digital techniques: Lessons 32h, independent work (homework assignments) 106h, teaching period 3
Fundamentals of computer engineering: Lessons 8h, independent work (homework assignment) 47h, teaching period 3
Project work: Independent work 55h, teaching period 4

Target group:

Primarily 1st year electrical engineering and computer science and engineering BSc students. The course can be taken by the students of the university of Oulu.

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Textbook: Mano: Logic and Computer Design Fundamentals, MIT OpenCourseWare and execise literature.

Assessment methods and criteria:

Homework assignment and project work.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

Jukka Lahti

Working life cooperation:

No

Other information:

-

462108S: Mechatronics, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462051S	Mechatronics	5.0 op

ECTS Credits:

6 / 160 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods III and IV. It is recommended to complete the course at the 4th spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the definition of mechatronics. He/she is able to divide a mechatronic system into its elementary units and he/she is able to explain the significance and interfaces of the various units. The student is able to analyze the kinematic and dynamic properties of mechanisms. Furthermore, the student is able to construct control profiles for actuators driving mechanisms. The student is able to describe the difference between kinematic and inverse kinematic problem, which he/she can also solve. In addition to this, the student is able to determine the basic structure of a digital control system. He/she is able to evaluate the preconditions for digital control as well as the requirements for hardware.

Contents:

Simulation and modelling of mechatronic systems; Actuators suitable for servo control; Basics of control systems; Sensors in closed-loop applications; Determination of control profiles; Kinematics and inverse kinematics of mechanisms.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 112 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Machine Sensor Technology

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Lecturer Toni Liedes

Production engineering

463102A: Manufacturing technology I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pirkola, Heikki Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

463053A-01 Manufacturing Technology I, examination 0.0 op

463053A-02 Manufacturing Technology I, exe 0.0 op

463053A Manufacturing Technology I 3.5 op

463053A2 Manufacturing Technology I 5.0 op

ECTS Credits:

5 ects/135 hours of work

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Lectures and exercises take place during the spring periods III - IV.

Learning outcomes:

The objective of the course is to familiarize students with the fundamentals of the functions and manufacturing methods of an engineering workshop. In order to apply manufacturing technology, students must know the features of different alternatives and be able to make technically and economically correct choices and combinations. This course emphasizes practicality and a general view of production. After the course, the student is capable of explaining manufacturing functions and methods of an engineering workshop. He/she is able to select parts manufacturing methods, machining data, machine tools and tooling equipment. In addition he/she can evaluate the alternatives of production automation in manufacturing functions.

Contents:

Features of different machining methods and machine tools; Selection of a blank machining method and machine tool according to type of work piece, accuracy and volume of production; Costs and technological possibilities of different machining methods; A review of control techniques, programming, jigs and tools

Mode of delivery:

Face-to-face -teaching

Learning activities and teaching methods:

Lectures 40 h and exercises 55 h (10 h of guided teaching) are held during periods III and IV. The course will be passed with a final exam and exercises which need to be returned and accepted. The final grade is a combined result of exercises and a final exam.

Prerequisites and co-requisites:

463101A Introduction to Manufacturing Technology

Recommended or required reading:

Manufacturing, Engineering & Technology, Fifth Edition, by Serope Kalpakjian and Steven R. Schmid. ISBN 0-13-148965-8. © 2006 Pearson Education, Inc., Upper Saddle River, NJ. The additional material that is in English will be given distributed at the lectures.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from exercises (grading 0,4) and the finai exam (grading 0,6).

Grading:

Numerical grading scale 1-5.

521159P: Principles of Digital Fabrication, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Georgi Georgiev

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521159P	Principles of Digital Fabrication (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS credits/ 135 hours of work

Language of instruction:

Finnish/English

Timing:

The course will be held in the spring semester, during period IV.

Learning outcomes:

In this course the students will learn the whole process of digital fabrication in FabLab. They will learn how to create an interactive 3D prototype, design mechanical parts for prototype, create basic electronics, implement a control logic for open hardware embedded board, and work in teams on project.

Contents:

The course teaches students to (1) design mechanical components with solid modeling tools, (2) build necessary electronics, and (3) implement software to a microcontroller, to create in FabLab a physical gadget that interacts with the world around it.

Mode of delivery:

Face-to-face teaching (Lectures)/ Individual work towards project

Learning activities and teaching methods:

Lectures 30h / Individual work 123h. There are sessions each week in FabLab where guidance is available (min total 16 h).

Target group:

This course is included in the computer science bachelor degree program. It is also available for all degree programs in the university. The course is offered to high-school students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

There is no recommended or required reading. The tutorials for tools and software (or links to such tutorials) will be provided in the course.

Assessment methods and criteria:

The course will be evaluated on the basis of the project delivered by the teams of students. Essential part of this reporting is the documentation of the project.

Grading:

pass/fail

Person responsible:

Georgi Georgiev

Working life cooperation:

-

Other information:

The course is also offered to high-school students with special study right and gives 5 ECTS credits that can be included in some bachelor’s degrees at University of Oulu.
The exercises are in FabLab:
https://www.oulu.fi/fablab/node/32345

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440143: Module Preparing for the Major, Process Engineering, 40 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Common studies

477013P: Introduction to Process and Environmental Engineering, 5 op

Voimassaolo: 01.12.2016 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Eetu-Pekka Heikkinen
Opintokohteen kielet: Finnish

ECTS Credits:

5 cr / 135 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods I and II. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

Students can examine industrial processes using the methods and perspectives of process and environmental engineering (e.g. unit operations, material management, phenomenon-based considerations, automation, energy and environment) and they recognize the role of different areas of the process and environmental engineering, when these areas are considered in more detail in the forthcoming courses.

Contents:

1. Unit operations. 2. Material balances. 3. Phenomenon-based considerations. 4. Material transport. 5. Process control and automation. 6. Principles in use, planning and protection of water and land resources: primary production, municipalities and industry. 7. Energy systems. 8. Productive activity as a part of society.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Pair exercises and contact-education that supports these exercises. The amount of classroom education is 16-32 hours the rest being studying independently. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

No prerequisities.

Recommended optional programme components:

This course is an introduction to the other courses of process and environmental engineering. Additionally, this course has connections to the course of Technical communication (900060A). It is recommended to complete these courses simultaneously if possible.

Recommended or required reading:

Material will be distributed during lectures and via courses www-site. Students are required to acquire additional material for the exercises.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are eight exercises that are made as pair-work. Please note that the course is not organised in English.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

university lecturer Eetu-Pekka Heikkinen

Working life cooperation:

There is no direct working life cooperation in this course.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

477052A: Fluid Mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477301A	Momentum Transfer	3.0 op

ECTS Credits:

5 ECTS / 133 hours of work.

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in spring semester during 3 rd period. It is recommended to complete the course at the second (Bachelolor's) spring semester.

Learning outcomes:

After the course the student is able to determine the viscosity of pure substances and mixtures and to estimate the effect of temperature and pressure on viscosity. The student is able to recognise the interactions between a solid body and flowing fluid and to distinguish the forces, their directions and to calculate their magnitudes. The student is able to formulate momentum balance equations and to solve these in order to calculate velocity distribution, flow rate and pressure drop. The student is able to distinguish laminar and turbulent flow regimes from others and is able to use the correct equations according to flow regime. After the course the student is able to design pipelines and other simple flow mechanical process equipment.

Contents:

Viscosity. Mechanism of momentum transfer. Creating and solving differential momentum balances. Friction factor. Macroscopic balances. Flow in pipes and open-channels.

Mode of delivery:

Face-to-face teaching in Finnish. Book examination in English.

Learning activities and teaching methods:

Lectures 45 h, homework 15 h and self-study 73 h. For foreign students written examination based on given literature.

Target group:

Bachelor's degree students of process and environmental engineering.

Prerequisites and co-requisites:

Knowledge of solving differential equations.

Recommended optional programme components:

The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Munson, B.R., Young, D.F. & Okiishi, T.H. Fundamentals of Fluid Mechanics.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are 5 intermediate exams. The course can also be completed by final examination. Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Kaisu Ainassaari

Working life cooperation:

No

Other information:

-

477401A: Thermodynamic Equilibria, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eetu-Pekka Heikkinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

470611A	Metallurgy Processes	7.0 op

ECTS Credits:

5 cr / 135 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period I. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

Student is capable of defining chemical equilibria of the systems that are related to industrial processes and understands the relevance of equilibria (and their computational determination) as a part of process analysis, planning and control. Additionally, (s)he can define a meaningful system to be considered in computation thermodynamics; i.e. (s)he can create a computationally solvable problem based on technical problem that in itself is not solvable computationally.

Contents:

Concepts of entalphy (H), entropy (S) and Gibbs free energy (G). The effect of temperature and pressure on H, S and G. Chemical and phase equilibria. Activity and activity coefficient. Calculation of thermodynamic equilibria using equilibrium constant as well as Gibbs free energy minimisation.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Lectures (26 hours), software exercises (4 hours) as well as other exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

'Basic Principles in Chemistry' and 'Material and Energy Balances' or corresponding knowledge is recommended as prerequisite.

Recommended optional programme components:

This is one of the courses in which physical chemistry is used in the applications of process and environmental engineering. It is part of a education that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Material will be distributed during lectures and exercises. It is also available via courses www-site.

Assessment methods and criteria:

Students are required to make a portfolio consisting of a learning diary and exercices. Please note that the course is organised only in Finnish.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Eetu-Pekka Heikkinen

Working life cooperation:

There is no direct working life cooperation in this course.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

477221A: Material and Energy Balances, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ahola, Juha Lennart

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477231A Material and Energy Balances I (OPEN UNI) 2.0 op
ay477232A Material and Energy Balances II (OPEN UNI) 3.0 op
ay477221A Material and Energy Balances (OPEN UNI) 5.0 op
477201A Material and Energy Balances 5.0 op
470220A Fundamentals of Chemical Process Engineering 5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

Finnish. The course can be completed in English as a book examination.

Timing:

Spring periods 3 and 4.

Learning outcomes:

The student is able to formulate material and energy balances for a process by taking into account the restrictions set by reaction stoichiometry. The student knows how the created mathematical formulation can be exploited in process consideration.

Contents:

Formulation of material and energy balances by taking into account the effects of chemical reactions.

Mode of delivery:

Lectures and group exercise

Learning activities and teaching methods:

Lectures 40h, group work 10h and self-study 80h

Target group:

Bachelor students in of Process or Environmental Engineering

Prerequisites and co-requisites:

High school level chemistry, mathematics and physics.

Recommended optional programme components:

The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Reklaitis, G.V.: Introduction to Material and Energy Balances. John Wiley & Sons, 1983. ISBN 0-471-041319.

Assessment methods and criteria:

During the course, there are two intermediate exams and both of them must be passed. Alternatively student can participate in final exam after the course. In addition to this, the students will be making a group exercise, which will be evaluated.

Person responsible:

Juha Ahola

Other information:

This course replaces the course 477201A Material and Energy Balances, 5 ects.

477323A: Mass and Heat Transfer, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477322A	Heat and Mass Transfer	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Implementation in autumn semester during 1 st period. It is recommended to complete the course at the third (Bachelor's) autumn semester.

Learning outcomes:

After passing the course the student knows what happens when heat is transferred by conduction, convection and radiation. The student can describe energy transfer with differential energy balances

connected with momentum balances; In macro scale the student is able to solve practical heat transfer problems by correlating heat transfer coefficients to dimensionless flow and material characteristics; With the help of these transfer coefficients the student is capable of estimating the size of heat transfer equipment, especially heat exchangers and select the most suitable and profitable types; and to Sketch large heat nets and to diminish the costs of the equipments.
The student is able to use the pinch method which optimises the number of heat exchangers and total energy consumption. He/she is also able to apply the exergy principle to make work from thermal energy. With the aid of this principle he/she will be able to divide the costs of the used energy in right proportion based on the processing stage. He/she student is able to explain diffusion as a phenomenon and the factors affecting it. He/she is able to model mass transfer in simple systems by using the theory of Fick. The student is capable of modeling diffusion by differential mass balances. He/she recognises the special features of mass transfer in turbulent systems and the role of different transport phenomena in mass transfer equipment. He/she has rudimentary practical skills applicable to the scale-up of the equipment used for absorption.

Contents:

Mechanism of heat transfer. Creating and solving differential energy balances. Heat transfer coefficient. Macroscopic balances. Selection of a proper type of heat exchanger.Scale-up and design of a heat exchanger.Design of heat exchanger networks using pinch technology.Exergy analysis for the heat flows. Diffusion. The Fick law of diffusion. Mass transfer in simple systems. Differential mass balances. Models of mass transfer in turbulent systems. Interphase mass transfer. Absorption.

Mode of delivery:

Face-to-face teaching in Finnish. Book examination possible in English.

Learning activities and teaching methods:

Lectures 45 h, homework 15 h and self-study 73 h. For foreign students written examination based on given literature.

Target group:

Bachelor's degree students of process and environmental engineering.

Prerequisites and co-requisites:

Knowledge of solving differential equations.

Recommended optional programme components:

The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

(Will be announced later)

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are 4 intermediate exams. The course can also be completed by final examination.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Kaisu Ainassaari

Working life cooperation:

No

Other information:

Replaces the course 477322A Lämmön ja aineensiirto, 5 ects.

Process engineering

477121A: Particle Technology, 5 op

Voimassaolo: 01.08.2015 - 31.07.2022

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477120A	Fluid and Particle Engineering	5.0 op
477101A	Fluid and Particle Engineering I	3.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Implementation in spring term, period 4

Learning outcomes:

Upon completion of the course, a student should be able to identify the mainline mechanical processes in process industry enhancing the degree of upgrading, as well as recovery operations related to those mechanical main processes. The student is able to identify the equipment related to the mechanical processes and can explain their purpose of use and their operational principles.

Contents:

Granular material and sampling, particle size and particle size distribution, specific surface area, basics in grinding, crushing, sieving and mineral concentration, froth flotation, mineral concentration methods based on density difference, magnetic concentration and other concentration methods, granulation, separation from suspensions

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The implementation methods of the course are varying. Lectures and exercises max. 48 h. A part of teaching can be replaced by home or group works or with web learning.

Target group:

Bachelor students in process and environmental engineering

Prerequisites and co-requisites:

Introduction to process and environmental engineering I (477011P)

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures

Assessment methods and criteria:

This course utilizes continuous assessment including two intermediate exams and homework.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

No

477122A: Bulk Solids Handling, 5 op

Voimassaolo: 01.08.2015 - 31.07.2023

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477120A	Fluid and Particle Engineering	5.0 op
477102A	Bulk Solids Handling	4.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

Implementation in period 2 (autumn term)

Learning outcomes:

Upon completion of the course, a student should be able to identify auxiliary mechanical unit processes as well as equipment and phenomena related to them. In addition, the student can explain application of unit processes and can describe their operational principles.

Contents:

Liquid and suspensions: fluid mechanics, pumping and hydraulic transport, mixing. Gases and aerodispersions: gas dynamics, compression, pneumatic transport. Granular bulk material: properties, storage, mechanical transportation, fluidization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The implementation methods of the course vary. Lectures and exercises max. 48 h. A part of teaching can be replaced by home or group works or with web learning.

Target group:

Bachelor students in process or environmental engineering

Prerequisites and co-requisites:

477101A Particle Technology

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures

Assessment methods and criteria:

This course utilizes continuous assessment including three intermediate exams with potential web learning, lecture diary and/or homework. Alternatively, the course can also be completed by taking the end exam.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Elisa Koivuranta

Working life cooperation:

No

Other information:

-

477222A: Reactor Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ahola, Juha Lennart

Opintokohteen kielet: Finnish

Leikkaavuudet:

477202A	Reactor Analysis	4.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

Finnish

Timing:

Period 2 (autumn term)

Learning outcomes:

By completing the course the student is able to explain the determination methods of the reaction rate from experimental data and he/she can illustrate the basics of deterministic modelling. On that basis, the student has skills to analyse the behaviour of ideal reactors and to perform initial reactor selection and sizing.

Contents:

Elementary reactions, kinetics of homogenous reactions. Reaction rate on the basis of experimental data. Modelling of ideal reactors. Yield, selectivity and reactor size. Heuristics for selecting reactor type and operating conditions.

Mode of delivery:

Lectures and small group exercises

Learning activities and teaching methods:

Lectures 40h and self-study 90h

Target group:

Bachelor students in process and environmental engineering, minor subject students

Prerequisites and co-requisites:

Objectives of 477201A Material and Energy Balances and 477401A Thermodynamic Equilibrium

Recommended optional programme components:

-

Recommended or required reading:

Lecture handouts. Levenspiel, O., Chemical Reaction Engineering. John Wiley & Sons, New York, 1972 (Chapters 1-8). Atkins, P.W.: Physical Chemistry, Oxford University Press, 2002. 7th Ed. (Parts) ISBN 0-19-879285-9.

Assessment methods and criteria:

Combination of examination and group exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer Juha Ahola

Working life cooperation:

No

Other information:

-

Automation engineering

477051A: Automation Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hiltunen, Jukka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

477601A	Process Automation Systems	4.0 op

ECTS Credits:

5 ECTS /133 h of work

Language of instruction:

Finnish

Timing:

Autumn, period 2

Learning outcomes:

Students learn how to use PI diagrams, field instruments, automation systems and PLCs in design, implementation and commissioning projects. Students can configure and program the basic automation functions in DCSs and PLCs

Contents:

The operational and structural descriptions and concepts of process automation, automation commissioning projects, PI diagrams and field devices, configuration tools for automation functions, logic programming, telecommunication technology in automation, field buses, examples of commercial DCSs, PLCs and field bus systems

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures, demonstrations, configuration and logic programming exercises, excursion to a neighbouring industrial plant

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

477011P Introduction to process and environmental engineering I and 448010P Introduction to process and environmental engineering II are recommended

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes and handouts, manuals/handbooks

Assessment methods and criteria:

Learning diary or examination

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Jukka Hiltunen and Aki Sorsa

Working life cooperation:

No

Other information:

-

477502A: Experiment design and analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

470432A	Process Control Engineering II	5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

Finnish

Timing:

Implementation in the 4th period on the spring term

Learning outcomes:

After the course, the student knows different experimental design methods and their applicability for different problems. He can also design experiments for multi-variable processes and analyze the results. He can also use some basic means to visualize the results got from experimental data and choose proper tools for experiment design problems.

Contents:

Systematic design of process experiments with matrix techniques (Hadamard, Central Composite Design, Taguchi). Graphical and statistical analysis of experimental data. Correlation, regression and variance analysis. Dynamic data based modelling.

Mode of delivery:

Lectures and extensive exercise work

Learning activities and teaching methods:

Lectures during one period

Target group:

Bachelor’s students in process and environmental engineering

Prerequisites and co-requisites:

Course Process Dynamics is recommended beforehand

Recommended optional programme components:

The course forms a basis to the advanced courses in the field of control engineering

Recommended or required reading:

Reading materials. *Additional literature*: Diamond W.J.: Practical Experiment Designs. Lifetime Learning Publications. Belmont, California, 1981. 348 pp.

Assessment methods and criteria:

Examination. It is recommended to take the course also according to the principle of continuous evaluation.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Read more about assessment criteria at the University of Oulu webpage.

Person responsible:

Aki Sorsa

Working life cooperation:

No

Other information:

For exchange/international students also the course 477041S Experimental Design is recommended

477501A: Process dynamics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477501A	Process Control Engineering I	5.0 op
470431A	Process Control Engineering I	5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

Finnish/English. The main lecturing language is Finnish, but the course can also be taken in English with some special arrangements. Contact the responsible person.

Timing:

Negotiable (for the English version)

Learning outcomes:

After the course, the student understands the basic principles of dynamical behaviour of different processes, can write dynamic mass and energy balances for unit processes, and can solve these with the help of the transfer function approach. He knows also the connection between process control and process dynamics.

Contents:

Basics of process models and dynamics. Dynamic models. Lumped and distributed parameter models. Practical examples of different unit processes such as chemical reactors, distillation columns and heat exchangers. Modelling of large-scale processes.

Mode of delivery:

Negotiable (the course can be taken in English with some special arrangements - contact the responsible person)

Learning activities and teaching methods:

Solving exercise problems; textbook

Target group:

Exchange and other international students (for the English version)

Prerequisites and co-requisites:

Courses Material and Energy Balances, Heat Transfer, Mass Transfer and Control System Analysis recommended beforehand

Recommended optional programme components:

The course forms a basis to the advanced courses in the field of control engineering

Recommended or required reading:

Parts of the textbook used: Luyben, W.L.: Process Modeling, Simulation and Control for Chemical Engineers. McGraw Kogakusha Ltd., Tokyo 1973, 558 pp.

Assessment methods and criteria:

Homework and written/oral test

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. Read more about assessment criteria at the University of Oulu webpage.

Person responsible:

Marko Paavola

Working life cooperation:

No

Other information:

-

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440142: Module Preparing for the Major, Civil Engineering, 40 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

485201A: Building information modeling and CAD, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Civil Engineering field
Arvostelu: 1 - 5, pass, fail
Opettajat: Antti Niemi
Opintokohteen kielet: Finnish

ECTS Credits:

5 ETCS / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4.

Learning outcomes:

Upon completion of the course, student will know the basics of computer-aided modeling and design. The course enables application and development of modeling and design applications and further development as an independent user of various modeling systems and platforms.

Contents:

Principles of geometric and data modeling. Representation of curves and surfaces. Properties of CAD and modelling applications and exercises. Basic algorithms related to geometric and data modelling.

Mode of delivery:

Face-to-face and independent study

Learning activities and teaching methods:

Lectures and exercises 30 h, independent study and project work 105 h

Target group:

Bachelor level students in the degree program of civil engineering

Prerequisites and co-requisites:

Basic course in mathematics

Recommended optional programme components:

The course supports advanced courses in civil engineering

Recommended or required reading:

Lecture and exercise material

Assessment methods and criteria:

Continuous assessment of exercise work and home work

Person responsible:

Antti H. Niemi ja Pekka Rossi

461102A: Statics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay461102A	Statics (OPEN UNI)	5.0 op
461016A-01	Statics, examination	0.0 op
461016A-02	Statics, exercises	0.0 op
461016A	Statics	5.0 op

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

Lectures in finnish, foreign students follow the course by reading independently the books in english and taking part to the exercises and exams where all material is given in english.

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

After the course, the student can calculate forces and moments of loaded structures using equations of vector algebra and trigonometry. He/she can draw a free body diagram of the force system and then solve the unknown forces by using equations of equilibrium. He/she can determine resultants from uniformly distributed loads and apply Coulomb's law of friction in the problem equilibrium. The student can solve problems of internal and external forces of particle systems and rigid body systems in case of static equilibrium. Especially, he/she can draw shear force and bending moment diagrams for beam structures.

Contents:

Fundamental laws and concepts in statics. Force systems and their treatment. Equilibrium of particles and rigid bodies. Static forces in isostatic structures such as beams, frames, cables and trusses. Friction.

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

Lectures 55 h / exercises 42 h / independent work of solving homework problems 52 h.

Target group:

Compulsory for candidate degree students of mechanical engineering programme.

Prerequisites and co-requisites:

Now prerequisites required.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T.: Statiikka, Pressus Oy, Tampere 2005; Beer, F., Johnston, R.: Vector Mechanics for Engineers, Statics, McGraw-Hill Book Company, 1996.

Assessment methods and criteria:

In the course acceptable homework and midterm exams / final exam are required. This course utilizes continuous assessment. There are four midterm exams, of which the last one is at the same time a final exam. Homework contain every week three problems that are marked. The student is allowed to participate to a final exam, when the homework is accepted.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Hannu Lahtinen

Other information:

The course gives ability for understanding static equilibrium, ability for determining force balance in structures and readiness for later studies.

461103A: Strength of materials I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

461010A-01 Strength of Materials I, examination 0.0 op

461010A-02 Strength of Materials I, exercises 0.0 op

461010A Strength of Materials I 7.0 op

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

Lectures in Finnish, foreign students follow the course by reading independently the books in English and taking part to the exercises and exams where all material is given in English.

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 1st spring semester.

Learning outcomes:

After the course, the student can determine stresses and strains of structures under loading. He/she can change the general stress and strain states from one coordinate system to another and can also apply constitutive equations in calculations. The student can dimension typical structures such as tension and compression bars, torsion bars and straight beams.

Contents:

Purpose and goals of strength of materials. Experimental elastic properties and strength of steel. Tension and compression of straight bars. Round torsion bar under shear force and torsion loads. Stresses and deflection curves in straight beams under bending moments. Stress state, strain state and constitutive equations, principal stresses, Mohr's circle. Stress hypotheses.

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

Lectures 55 h / exercises 42 h / independent work of solving homework problems 52 h.

Target group:

Compulsory for Bachelor's degree students of mechanical engineering programme.

Prerequisites and co-requisites:

The recommended preceding course is 461102A Statics.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T., Pajunen, S.: Lujuusoppi, Pressus Oy, Tampere, 2010, Pennala, E.: Lujuusopin perusteet, Moniste 407, Otatieto 2002; Karhunen, J. & al.: Lujuusoppi, Otatieto 2004; Beer, F., Johnston, E., Mechanics of materials , McGraw-Hill, 2011; Gere, J.M., Timoshenko, S.P., Mechanics of Materials, Chapman&Hall, 1991.

Assessment methods and criteria:

In the course acceptable homework and midterm exams / final exam are required. This course utilizes continuous assessment. There are four midterm exams, of which the last one is at the same time a final exam. Homework contain every week three problems that are marked. The student is allowed to participate to a final exam, when the homework is accepted.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Hannu Lahtinen

Other information:

The course looks into the most important principal concepts of strenght of materials and gives ability for dimensioning of simple structures such as straight bars in tension, compression or torsion loads and straight beams under bending moments.

466101A: Introduction to building construction, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Hannu Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

485101A Introduction to building construction 5.0 op
460116A-01 Introduction to Contruction Engineering, examination 0.0 op
460116A-02 Introduction to Contruction Engineering, exercise work 0.0 op
460116A Introduction to Building Construction 3.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Spring, periods 3-4
Course 485101A replaces this course in academic year 2020-2021.

Learning outcomes:

After completing the course students can describe the construction process, different parties of a construction project and their role in the project. Students can also explain how laws and legislation affects the construction, design and production of building structures. They can describe the material properties of the most common construction materials. They can also explain the certification process of a building material or product and the environmental legislation in construction.

Contents:

The following topics are covered during the course: Construction law and legislation. Different phases of a construction project. The raw materials, production and properties of the most common construction materials and products. Quality assurance and certification of building products. Environmental declarations. Life cycle assessment.

Mode of delivery:

Lecture room teaching.

Learning activities and teaching methods:

Lectures and exercises

Target group:

Students studying structural engineering

Recommended or required reading:

Lecture material. Land use and building legislation. The National Building Code of Finland

Assessment methods and criteria:

Passed practical works and exam

Grading:

The course utilizes a numerical grading scale 1-5. Numerical scale zero stands for a fail

Person responsible:

University teacher Hannu Liedes

466102A: Introduction to structural design, 3 - 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Hannu Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

485102A Introduction to structural design 5.0 op
460117A-01 Introduction to Structural Design, examination 0.0 op
460117A-02 Introduction to Structural Design, exercise work 0.0 op

460117A Introduction to Structural Design 6.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-2
Course 485102A replaces this course in academic year 2020-2021.

Learning outcomes:

After completing the course the student is able to name technical regulations and instructions, which guide construction. After completing the course students can explicate principle of verifications and plastic theory on structure design and also different loads on structure. Student estimate design loads by calculation and design load effect in structures. Student can describe different structure and bracing systems.

Contents:

Regulations and supervising. The principle of design verification. The loads and effect. The principle of using of eurocode. The principle of plastic theory on on structure design. Structure systems. The joints of structures.

Mode of delivery:

Lecture room teaching.

Learning activities and teaching methods:

Lectures and exercises

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

461016A Statics and 460101A Strength of Materials I

Recommended or required reading:

Lecture notes (mainly in Finnish), Finnish law and legislation, National building code of Finland, Eurocode standards

Assessment methods and criteria:

Passed practical works and exam

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

University teacher Hannu Liedes

Other information:

This course will replace course 485102A in Academic year 2020-21.

485021A: Construction Contracting, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Hannu Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

488119A Basics of infrastructure planning and development 5.0 op

466113S Construction economics 5.0 op

460165A-02 Introduction to Construction Economics I, practical work 0.0 op

460165A-01 Introduction to Construction Economics I, examination 0.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Person responsible:

Hannu Liedes

Other information:

This Course replaces courses 466113S and 488119A.

488115A: Geomechanics, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomela, Anne Marika

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English and Finnish

Timing:

The course unit is held in the autumn semester, during period 1
Course 485301A replaces this course in academic year 2020-2021.

Learning outcomes:

Upon completion this course, the student will understand the fundamental of Soil mechanics, foundation engineering and soil freezing and thawing.

Contents:

Origins and composition of soils, classification of soils, stress and strains in soils, mechanical properties of soils, stability of slopes, bearing capacity of foundation, seepage analyses, freezing and thawing of soils, site investigations and in situ testing.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h) and calculation exercises (30 h) also independent work (73 h)

Target group:

Students in Bachelor and Master programs of environmental engineering and civil engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

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Recommended or required reading:

Lecture handout and other materials delivered in lectures, Principles of Geotechnical Engineering by Das, B.M and An Introduction to Geotechnical Engineering, By Holtz, R.D. and Kovacs, W.D.

Assessment methods and criteria:

Examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Anne Tuomela

Working life cooperation:

No

Other information:

Lectures are mostly in English and exercises mostly in Finnish but the student can complete the course using both languages.

485103A: Building physics, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Filip Fedorik

Opintokohteen kielet: English

Leikkaavuudet:

466111S	Building physics	5.0 op
460160S-01	Building Physics, examination	0.0 op
460160S-02	Building Physics, exercises	0.0 op
460160S	Building Physics	3.5 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

English

Timing:

Autumn, Periods 1-2

Learning outcomes:

After completing the course the student can explain basic phenomenon of building physics. The student can analyse and describe heat, air and moisture transfer in buildings and also explain main causes of typical moisture damages. The student can explain factors affecting energy efficiency and can calculate the energy efficiency number. The student knows the calculation methods in acoustics.

Contents:

Thermal isolation design. Determination of structure temperature. Moisture transfer and moisture exiting. Airflows in structures. Energy efficiency in buildings. Acoustic design.

Mode of delivery:

Face-to-face and distance learning

Learning activities and teaching methods:

Lectures, excercises, case studies, and self directed learning

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction

Recommended or required reading:

The material that is in English will be distributed at the lectures
1) Lecture notes (mainly in Finnish)
2) Suomen rakentamismääräyskokoelman osatC1, C2, C3, C4 ja D3.
3) Introduction to Building Physics, Hagentoft, C.-E. (2001), ISBN 91-44-01896-7, (As specified in lectures).

Assessment methods and criteria:

Excercises and exam

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

university lecturer Raimo Hannila

Other information:

This course will replace course 466111S Building Physics in Academic year 2020-21.

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440144: Module Preparing for the Major, Environmental Engineering, 40 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

477013P: Introduction to Process and Environmental Engineering, 5 op

Voimassaolo: 01.12.2016 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Eetu-Pekka Heikkinen
Opintokohteen kielet: Finnish

ECTS Credits:

5 cr / 135 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods I and II. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

Students can examine industrial processes using the methods and perspectives of process and environmental engineering (e.g. unit operations, material management, phenomenon-based considerations, automation, energy and environment) and they recognize the role of different areas of the process and environmental engineering, when these areas are considered in more detail in the forthcoming courses.

Contents:

1. Unit operations. 2. Material balances. 3. Phenomenon-based considerations. 4. Material transport. 5. Process control and automation. 6. Principles in use, planning and protection of water and land resources: primary production, municipalities and industry. 7. Energy systems. 8. Productive activity as a part of society.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Pair exercises and contact-education that supports these exercises. The amount of classroom education is 16-32 hours the rest being studying independently. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

No prerequisities.

Recommended optional programme components:

This course is an introduction to the other courses of process and environmental engineering. Additionally, this course has connections to the course of Technical communication (900060A). It is recommended to complete these courses simultaneously if possible.

Recommended or required reading:

Material will be distributed during lectures and via courses www-site. Students are required to acquire additional material for the exercises.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are eight exercises that are made as pair-work. Please note that the course is not organised in English.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

university lecturer Eetu-Pekka Heikkinen

Working life cooperation:

There is no direct working life cooperation in this course.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

477401A: Thermodynamic Equilibria, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eetu-Pekka Heikkinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

470611A	Metallurgy Processes	7.0 op

ECTS Credits:

5 cr / 135 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period I. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

Student is capable of defining chemical equilibria of the systems that are related to industrial processes and understands the relevance of equilibria (and their computational determination) as a part of process analysis, planning and control. Additionally, (s)he can define a meaningful system to be considered in computation thermodynamics; i.e. (s)he can create a computationally solvable problem based on technical problem that in itself is not solvable computationally.

Contents:

Concepts of entalphy (H), entropy (S) and Gibbs free energy (G). The effect of temperature and pressure on H, S and G. Chemical and phase equilibria. Activity and activity coefficient. Calculation of thermodynamic equilibria using equilibrium constant as well as Gibbs free energy minimisation.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Lectures (26 hours), software exercises (4 hours) as well as other exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

'Basic Principles in Chemistry' and 'Material and Energy Balances' or corresponding knowledge is recommended as prerequisite.

Recommended optional programme components:

This is one of the courses in which physical chemistry is used in the applications of process and environmental engineering. It is part of a education that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Material will be distributed during lectures and exercises. It is also available via courses www-site.

Assessment methods and criteria:

Students are required to make a portfolio consisting of a learning diary and exercices. Please note that the course is organised only in Finnish.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University lecturer Eetu-Pekka Heikkinen

Working life cooperation:

There is no direct working life cooperation in this course.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

477052A: Fluid Mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477301A	Momentum Transfer	3.0 op

ECTS Credits:

5 ECTS / 133 hours of work.

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in spring semester during 3 rd period. It is recommended to complete the course at the second (Bachelolor's) spring semester.

Learning outcomes:

After the course the student is able to determine the viscosity of pure substances and mixtures and to estimate the effect of temperature and pressure on viscosity. The student is able to recognise the interactions between a solid body and flowing fluid and to distinguish the forces, their directions and to calculate their magnitudes. The student is able to formulate momentum balance equations and to solve these in order to calculate velocity distribution, flow rate and pressure drop. The student is able to distinguish laminar and turbulent flow regimes from others and is able to use the correct equations according to flow regime. After the course the student is able to design pipelines and other simple flow mechanical process equipment.

Contents:

Viscosity. Mechanism of momentum transfer. Creating and solving differential momentum balances. Friction factor. Macroscopic balances. Flow in pipes and open-channels.

Mode of delivery:

Face-to-face teaching in Finnish. Book examination in English.

Learning activities and teaching methods:

Lectures 45 h, homework 15 h and self-study 73 h. For foreign students written examination based on given literature.

Target group:

Bachelor's degree students of process and environmental engineering.

Prerequisites and co-requisites:

Knowledge of solving differential equations.

Recommended optional programme components:

The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Munson, B.R., Young, D.F. & Okiishi, T.H. Fundamentals of Fluid Mechanics.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are 5 intermediate exams. The course can also be completed by final examination. Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Kaisu Ainassaari

Working life cooperation:

No

Other information:

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477221A: Material and Energy Balances, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ahola, Juha Lennart

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477231A	Material and Energy Balances I (OPEN UNI)	2.0 op
ay477232A	Material and Energy Balances II (OPEN UNI)	3.0 op
ay477221A	Material and Energy Balances (OPEN UNI)	5.0 op
477201A	Material and Energy Balances	5.0 op
470220A	Fundamentals of Chemical Process Engineering	5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

Finnish. The course can be completed in English as a book examination.

Timing:

Spring periods 3 and 4.

Learning outcomes:

The student is able to formulate material and energy balances for a process by taking into account the restrictions set by reaction stoichiometry. The student knows how the created mathematical formulation can be exploited in process consideration.

Contents:

Formulation of material and energy balances by taking into account the effects of chemical reactions.

Mode of delivery:

Lectures and group exercise

Learning activities and teaching methods:

Lectures 40h, group work 10h and self-study 80h

Target group:

Bachelor students in of Process or Environmental Engineering

Prerequisites and co-requisites:

High school level chemistry, mathematics and physics.

Recommended optional programme components:

The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

Reklaitis, G.V.: Introduction to Material and Energy Balances. John Wiley & Sons, 1983. ISBN 0-471-041319.

Assessment methods and criteria:

During the course, there are two intermediate exams and both of them must be passed. Alternatively student can participate in final exam after the course. In addition to this, the students will be making a group exercise, which will be evaluated.

Person responsible:

Juha Ahola

Other information:

This course replaces the course 477201A Material and Energy Balances, 5 ects.

477323A: Mass and Heat Transfer, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477322A	Heat and Mass Transfer	5.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Implementation in autumn semester during 1 st period. It is recommended to complete the course at the third (Bachelor's) autumn semester.

Learning outcomes:

After passing the course the student knows what happens when heat is transferred by conduction, convection and radiation. The student can describe energy transfer with differential energy balances connected with momentum balances; In macro scale the student is able to solve practical heat transfer problems by correlating heat transfer coefficients to dimensionless flow and material characteristics; With the help of these transfer coefficients the student is capable of estimating the size of heat transfer equipment, especially heat exchangers and select the most suitable and profitable types; and to Sketch large heat nets and to diminish the costs of the equipments.
The student is able to use the pinch method which optimises the number of heat exchangers and total energy consumption. He/she is also able to apply the exergy principle to make work from thermal energy. With the aid of this principle he/she will be able to divide the costs of the used energy in right proportion based on the processing stage. He/she student is able to explain diffusion as a phenomenon and the factors affecting it. He/she is able to model mass transfer in simple systems by using the theory of Fick. The student is capable of modeling diffusion by differential mass balances. He/she recognises the special features of mass transfer in turbulent systems and the role of different transport phenomena in mass transfer equipment. He/she has rudimentary practical skills applicable to the scale-up of the equipment used for absorption.

Contents:

Mechanism of heat transfer. Creating and solving differential energy balances. Heat transfer coefficient. Macroscopic balances. Selection of a proper type of heat exchanger.Scale-up and design of a heat exchanger.Design of heat exchanger networks using pinch technology.Exergy analysis for the heat flows. Diffusion. The Fick law of diffusion. Mass transfer in simple systems. Differential mass balances. Models of mass transfer in turbulent systems. Interphase mass transfer. Absorption.

Mode of delivery:

Face-to-face teaching in Finnish. Book examination possible in English.

Learning activities and teaching methods:

Lectures 45 h, homework 15 h and self-study 73 h. For foreign students written examination based on given literature.

Target group:

Bachelor's degree students of process and environmental engineering.

Prerequisites and co-requisites:

Knowledge of solving differential equations.

Recommended optional programme components:

The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:

(Will be announced later)

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are 4 intermediate exams. The course can also be completed by final examination.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Kaisu Ainassaari

Working life cooperation:

No

Other information:

Replaces the course 477322A Lämmön ja aineensiirto, 5 ects.

488102A: Hydrological Processes, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay488102A	Hydrological Processes (OPEN UNI)	5.0 op
480207A	Hydraulics and Hydrology	5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish, but also option to complete the course in English.

Timing:

The course is held in the autumn semester during the period 1. It is recommended to complete the course at the 1st autumn semester of the international master program of environmental engineering

Learning outcomes:

After the course, the student understands and can describe the main hydrological processes, water movements and hydraulics phenomenon quantitatively through mathematical methods. The student also understands and quantifies the relation between state and flow with rela-tion to snowmelt, evaporation, infiltration and groundwater flow.

Contents:

Hydrological cycle, physical properties of water, distribution of water resources, water balance, precipitation, evapotranspiration, soil and ground water, infiltration, runoff, snow hydrology, hydrometry, water quality of rivers and lakes.

Mode of delivery:

Face-to-face teaching and independent work with two assignment reports.

Learning activities and teaching methods:

Lectures 24 h, exercises 16 h and independent work 93 h. Totally 133 h.

Target group:

Students in international master programs of environmental engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following course or having corresponding knowledge prior to enrolling for the course unit: 477201A Material and Energy Balances and 477052A Fluid mechanics.

Recommended optional programme components:

The course is a prerequisite for most of master level studies.

Recommended or required reading:

Physical Hydrology (Dingman SL, 2002, 2nd Edition, ISBN 978-1-57766-561-8), Fluid Mechanics and Hydraulics (Giles, Evett and Liu, 3rd Edition, ISBN 0-07-020509-4)

Assessment methods and criteria:

The assignments must be returned and passed with threshold of 50% in order to get final examination. The final grade of the course is weighted average of assignment reports (80%) and examination (20%).

Grading:

The assignments must be returned and passed with threshold of 50% in order to get final examination. The final grade of the course is weighted average of assignment reports (80%) and examination (20%).

Person responsible:

University Lecturer Anna-Kaisa Ronkanen

Working life cooperation:

Examples solev in the lectures based on real problems

Other information:

The English version of the course is organized parelle to Finnish version of the course.

488210A: Environmental science and technology, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Väisänen, Virpi Maria

Opintokohteen kielet: Finnish

Leikkaavuudet:

488201A	Environmental Ecology	5.0 op

488505A: Waste managemet and recycling, 5 op

Voimassaolo: 01.09.2018 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jenni Ylä-Mella, Eva Pongracz

Opintokohteen kielet: Finnish

Leikkaavuudet:

488130A	Waste management and resources recovery	5.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

Finnish

Timing:

Autumn, period 1. Preferred time is the 2nd year

Learning outcomes:

After completing the course, the student will be familiar with the waste legislation and other policy instruments and is able to use the waste-related terminology. The student understands the responsibilities of the different actors and stakeholders in the municipal waste management system and knows the key waste minimization and recycling requirements. The student will also be able to plan and scale the municipal waste collection system for the households and to calculate the recycling and recovery rates of recyclables that must be achieved. The student knows the key recycling technologies for the main waste fractions and can calculate treatment costs for the major streams.

Contents:

Waste legislation in the EU and Finland. Waste Act and Regulations, waste hierarchy. Sorting of household waste: waste containers, collection points, transport and reception, responsibilities. Waste recycling and energy recovery technologies, recycling rates, producer responsibility schemes, utilization of bio-waste and energy recovery technologies. Waste Center operations, safe disposal of waste. Consumer habits, consumers responsibilities and future challenges in waste management.

Mode of delivery:

Face-to-face teaching, exercises and group works, company visits. The course has compulsory participation requirements.

Learning activities and teaching methods:

Lectures 30 h, exercises and group work 45 h, company visits 8 h, individual work 50 h.

Target group:

Bachelor’s students in process and environmental engineering, other minor subject students.

Recommended or required reading:

Lecture slides and information on recommended reading material will be provided during the course.

Assessment methods and criteria:

Continuous evaluation. Personal weekly assignments, exercises and group work during the course. Participating of at least 50 % of lectures and answering of at least 80% of weekly assignments are compulsory. Personal weekly assignments can be replaced with a final exam but one exercise, a group work and one company visit are always mandatory.

Grading:

The evaluation is based on personal weekly assignments (or exam), exercises and group work during the course. The scores obtained from assignments forms the final grade. The course uses a numerical grading Scale 1-5. In the numerical scale, zero stands for a fail.

Person responsible:

D.Sc.(Tech.) Jenni Ylä-Mella

Other information:

This course replaces course 488130A Waste management and resources recovery.

555205M: Engineering studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A400072: Module Preparing for the Option, 20 - 40 op

Voimassaolo: 01.08.2007 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

555206M: Elective studies in other Universities/Institutes, 0 - 30 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440171: Optional Studies, Bachelor of Science (Industrial Engineering and Management), 0 - 20 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Optional Studies
Laji: Study module
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

IEM electives

555214A: Working in the university community, 5 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish / English

Timing:

Periods 1-4

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the university community (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- analyse and find development targets related to the tasks

Contents:

Communication, collaboration, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills.

Mode of delivery:

The tuition will not be organised.

Learning activities and teaching methods:

Students complete tasks with their own activities to support the university community and their own professional growth.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management or similar knowledge.

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

The course can include several tasks as follows: Student Union 2 years 2 ECTS, University Board 1 year 2 ECTS, University Collegial Body 2 years 2 ECTS, Education Council 1 year 2 ECTS, Education Management Team 1 year 2 years, Faculty Management Team 1 year 2 ECTS, Faculty Board 2 years 2 ECTS, Faculty Education Council 2 years 2op, Student Union Board 1 year 1-3 ECTS, National Student Organisation 1 year 1-5 ECTS, Other major education policy and / or teaching development tasks 1-3 ECTS credits, Student Tutor or Teaching Assistant 2 ECTS cr.

The student writes a report on conducting the tasks, which includes the following: 1) In which positions did the student work, how long and how actively he/she participated? (0.5 pages). 2) What does the student think he/she has learned from the duties and how can the experience be utilized in the future? In particular, these skills should be considered: communication, co-operation, creativity, problem-solving, project management, learning, technical skills, international skills, commercial and financial skills and the development of self-knowledge (1 page). 3) How would the student think that the activity could be developed by the methods of industrial engineering and management? (1.5 pages). A report and a certificate on the tasks will be returned to the teacher tutor, who determines the number of credits to be awarded. The length of the report is 3 pages.

Grading:

pass / fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

-

555215A: Working life project, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish / English

Timing:

Periods 1-4

Learning outcomes:

Upon completion of the course, the student will be able to:

- apply the skills required for the tasks in the working life (communication, co-operation, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills)
- take responsibility for the tasks in a responsible manner
- analyse and find development targets related to the tasks

Contents:

Communication, collaboration, creativity, problem solving, project management, learning, technical skills, international skills, commercial and financial skills.

Mode of delivery:

The tuition will not be organised.

Learning activities and teaching methods:

Students complete tasks with their own activities to support their own professional growth.

Target group:

Industrial Engineering and Management students

Prerequisites and co-requisites:

555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management or similar knowledge.

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Participation in a company project, competition or similar (e.g. Accenture innovation challenge, ESTIEM Times). The student writes a report on conducting the tasks, which includes the following: 1) In which positions did the student work, how long and how actively he/she participated? (0.5 pages). 2) What does the student think he/she has learned from the duties and how can the experience be utilized in the future? In particular, these skills should be considered: communication, co-operation, creativity, problem-solving, project management, learning, technical skills, international skills, commercial and financial skills and the

development of self-knowledge (1 page). 3) How would the student think that the activity could be developed by the methods of industrial engineering and management? (1.5 pages). A report and a certificate on the tasks will be returned to the teacher tutor, who determines the number of credits to be awarded. The length of the report is 3 pages.

Grading:

pass / fail

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

-

Other information:

-

555200A: Bachelor's Thesis / Industrial Engineering and Management, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

ECTS Credits:
8 ECTS credits.
Language of instruction:
Finnish. The thesis can also be written in English.
Timing:
Periods 1-4.
Learning outcomes:
Upon completion of the course, the student will be able to:

- solve small problems in organisations independently
- create a research plan, define a research problem and research questions and manage his/her own work according to the research plan
- give a justified solution or proposals
- utilise the latest research information in the field and can critically evaluate the information obtained
- create a written report according to the instructions

Contents:
The research topics are presented in the bachelor's thesis seminar. The student can also propose an appropriate topic for the thesis.
Mode of delivery:
The tuition will be implemented as face-to-face teaching.
Learning activities and teaching methods:
Self-study 216 h. The student defines the research topic in co-operation with the instructor. The thesis can be a theoretical or empirical study.
Target group:
Industrial Engineering and Management students.
Prerequisites and co-requisites:
900061A Scientific Communication for Industrial Engineering and Management, 555204A Internship.
Recommended optional programme components:
The students will complete 555201A Bachelor's thesis seminar simultaneously.
Recommended or required reading:
The instructions and forms related to bachelor's thesis are available at Oulu University's webpage "Bachelor thesis".
Assessment methods and criteria:
This course includes writing a 25-page thesis. The work is assessed by using thesis assessment form.
Grading:
Pass-Fail
Person responsible:
Adjunct professor Jukka Majava
Working life cooperation:

Research topic / problem can be the examining and solving of the real problem of company or organisation.

Other information:

The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage "Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" - menu.

555201A: Bachelor's Thesis Seminar, 2 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Henna Longi

Opintokohteen kielet: Finnish

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

The course is organized in the autumn and spring semester.

Learning outcomes:

Upon completion of the seminar, student is able to:

- set and define research problem and objectives
- conduct a minor research as a literature review or empirical research
- apply the selected research methods and write an academic report
- evaluate and review academic reports and act as an opponent.

Contents:

Information retrieval for the research, conduct research in practice, scientific writing, acting as an opponent.

Mode of delivery:

The tuition will be implemented as face-to-face teaching. Partial independent work is possible if the bachelor's thesis is carried out during the summer time.

Learning activities and teaching methods:

Lectures 12 h, self-study 42 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

030005P Information Skills, 900061A Scientific Communication for Industrial Engineering and Management, 555201A Internship

Recommended optional programme components:

The students will complete 555200A Bachelor’s Thesis simultaneously. If course 030005P Information Skills is not completed, it can be completed simultaneously.

Recommended or required reading:

The materials will be defined at the beginning of the course.

Assessment methods and criteria:

Active participation in the seminar, presenting one’s own bachelor’s thesis, and acting as an opponent in the seminar.

Grading:

Pass-Fail.

Person responsible:

MSc Henna Longi

Working life cooperation:

No.

Other information:

The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage " Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" -menu.

555202A: Maturity Test / Bachelor of Science in Industrial Engineering and Management, 0 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555211A	Maturity Test / Industrial Engineering and Management	0.0 op

Assessment methods and criteria:
Maturity test related to the thesis topic is taken as an electronic exam in the Exam-system. Examination time is settled with the thesis supervisor. The assessor of the maturity test (supervisor) creates the maturity into the Exam system as a personal exam.
Grading:
Pass-Fail
Other information:
The general instructions related to thesis, matury test and graduation are available at the Oulu University's webpage " Thesis and graduation". Check the instructions for Industrial Engineering and Management Programme at "For you" -menu.

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

466111S: Building physics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Filip Fedorik

Opintokohteen kielet: English

Leikkaavuudet:

485103A	Building physics	5.0 op
460160S-01	Building Physics, examination	0.0 op
460160S-02	Building Physics, exercises	0.0 op
460160S	Building Physics	3.5 op

ECTS Credits:
5 ECTS credits / 132 hours of work
Language of instruction:
Englanti
Timing:
Autumn, Periods 1-2
Course 485103A Building Physics replaces this course in academic year 2020-2021.

Learning outcomes:
After completing the course the student can explain basic phenomenon of building physics. The student can analyse and describe heat, air and moisture transfer in buildings and also explain main causes of typical moisture damages. The student can explain factors affecting energy efficiency and can calculate the energy efficiency number. The student knows the calculation methods in acoustics.
Contents:
Thermal isolation design. Determination of structure temperature. Moisture transfer and moisture exiting. Airflows in structures. Energy efficiency in buildings. Acoustic design.
Mode of delivery:
Face-to-face and distance learning
Learning activities and teaching methods:
Lectures, excercises, case studies, and self directed learning
Target group:
Students studying structural engineering
Prerequisites and co-requisites:
466101A Introduction to building construction
Recommended or required reading:
The material that is in English will be distributed at the lectures 1) Lecture notes (mainly in Finnish) 2) Suomen rakentamismääräyskokoelman osat
C1, C2, C3, C4 ja D3. 3) Introduction to Building Physics, Hagentoft, C.-E. (2001), ISBN 91-44-01896-7, (As specified in lectures).
Assessment methods and criteria:
Excercises and exam
Grading:
Numerical grading scale 1-5. Grade 0 stands for a fail.
Other information:
This course will replace course 485103A Building physics in Academic year 2020-21.

488129S: Foundation Engineering, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomela, Anne Marika

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay485302A	Foundation Engineering (OPEN UNI)	5.0 op

ECTS Credits:
5 ECTS credits/133 hours of work
Language of instruction:
5 ECTS credits / 132 hours of work
Timing:
The course unit is held in the autumn semester during period 2
Course 485302A replaces this course in academic year 2020-2021.
Learning outcomes:
After completing the course, students can choose the right foundation type and design shallow and deep foundations. After completing the course the student is also able to design earth retaining structures, drainage and frost protection.
Contents:
The following topics are covered during the course: The basis of geotechnical and structural design of foundations. Foundation types and foundation construction. Piles and piled foundations. Ground bearing slabs. Gravity and embedded walls. Ground improvement. Drainage. Frost protection.
Mode of delivery:
Lecture room teaching.
Learning activities and teaching methods:
Lectures and exercises
Target group:

Master's students of environmental and civil engineering
Prerequisites and co-requisites:
Recommend course 488115A Geomechanics
Recommended or required reading:
1. Lecture material.
2. RIL 254-2016, Paalutusohje
3. RIL 263-2014 Kaivanto-ohje
4. Decoding Eurocode 7 (2008), Bond, A. and Harris, A., Taylor & Francis, (Contents are informed during lectures).

Assessment methods and criteria:
Passed practical works and exam
Grading:
Rating scale 1-5
Person responsible:
Anne Tuomela