Opasraportti

FMed - Medical and Wellness Technology (2016 - 2017)

Medical and Wellness Technology, Bachelor of Health Sciences, 180 ECTS Credits

The studies include all mandatory general, basic and intermediate studies and optional studies so that the total extent of degree is 180 ECTS credits. The studies recommended to perform in the order as presented. The letter Y end of the code refers to the general studies, letter P to basic studies and the letter A to intermediate studies. Before attending to the Electrical and Information courses a student must complete Introduction to Unix exercises. These are carried out before Elementary Programming course.

Optional Studies 13 ECTS credits

Optional studies are selected among basic and intermediate studies that support the degree so that the total extent of the degree is at least 180 ECTS credits. In the case of optional studies, if necessary, the student must agree with the organizing department for the participation to the course. Optional studies may include practical training in the field of biomedical engineering of up to 5 ECTS credits (course code 580120A Practical training 1).

Medical and Wellness Technology, Master of Health Sciences, 120 ECTS Credits

Studies include compulsory intermediate and advanced studies, advanced module's studies and optional studies. The student executes compulsory studies (70 ECTS credits), studies of chosen advanced module (at least 25 ECTS credits) and optional studies so that the total extent of the degree is at least 120 ECTS credits. Studies are executed according to the personal study plan. Studies are executed according to individual timetable depending on the optional studies. Some of the courses are held only every second year.

Advanced modules

Biomedical Technology

Medical Imaging

Health Technology

Optional Studies (about 25 ECTS credits)

Optional studies will be executed so that the total extent of the degree is at least 120 credits. Optional studies can be chosen from other advanced module or from other intermediate and advanced studies that support the degree. In the case of optional studies, if necessary, the student must agree with the organizing department for the participation for the course. Optional studies may include practical training in the field of biomedical engineering of up to 5 credits (580121A Practical training 2).

* The table has been made assuming that the student will execute all courses included in advanced module. At least 25 ECTS credits have to be performed from the chosen advanced module. Thus, some of the courses listed in the advanced module can be replaced by optional courses.

Tutkintorakenteet

Bachelor's Degree programme in Medical and Wellness Technology, Bachelor of Health Science (180 ect)

Tutkintorakenteen tila: published

Lukuvuosi: 2016-17

Lukuvuoden alkamispäivämäärä: 01.08.2016

General studies (18 op)

902153Y: English for Medical Technology, 1,5 - 3 op
580101Y: Introduction to University Studies, 2 op
040012Y: Knowledge and Research, 3,5 - 10 op
901043Y: Second Official Language (Swedish), Oral Skills, 2 op
901042Y: Second Official Language (Swedish), Written Skills, 1 op

040901Y: Basic Anatomy, 1,5 - 2 op
761111P: Basic mechanics, 5 op
031010P: Calculus I, 5 op
031075P: Calculus II, 5 op
050004Y: Chemistry, 3 op
031076P: Differential Equations, 5 op
761113P: Electricity and magnetism, 5 op
521141P: Elementary Programming, 5 op
764125P: Foundations of cellular biophysics, 5 op
764163P: Introduction to Biomedical Physics, 5 op
- *Compulsory*
  - 764163P-01: Introduction to Biomedical Physics (part 1), 0 op
  - 764163P-02: Introduction to Biomedical Physics (part 2), 0 op

580102P: Introduction to Medical and Wellbeing Technology, 5 op
766106P: Laboratory exercises in physics 2, 4 op
031078P: Matrix Algebra, 5 op
040902Y: Medical Biochemistry and molecular biology, 8 - 9 op
766116P: Radiation physics, biology and safety, 5 op
- *Compulsory*
  - 766116P-01: Radiation physics, biology and safety, exam, 0 op
  - 766116P-02: Radiation physics, biology and safety, laboratory exercises, 0 op

761114P: Wave motion and optics, 5 op

Intermediate Studies (vähintään 60 op)

041201A: Basics in eHealth, 5 op
521302A: Circuit Theory 1, 5 op
521337A: Digital Filters, 5 op
521109A: Electrical Measurement Principles, 5 op
080901A: Introduction to Technology in Clinical Medicine, 5 op
040112A: Physiology, 15 op
- *compuls12*
  - 040112A-01: Physiology, small group teaching, 2,5 op
  - 040112A-011: Physiology, biophysics small group teaching, 0,5 op
  - 040112A-021: Physiology, practicals entry examination, 1 op
  - 040112A-02: Physiology, term paper, 2 op
  - 040112A-03: Physiology, mid-term examination, 3 op

040112A-04: Physiology, final examination, 6 op
521431A: Principles of Electronics Design, 5 op
555285A: Project management, 5 op
031080A: Signal Analysis, 5 op
764327A: Virtual measurement environments, 5 op

Bachelor's Thesis and Maturity Test (10 op)

580209A: Bachelor's Thesis, 10 op
580211A: Maturity Test, 0 op

Optional studies (vähintään 13 op)

Optional studies are selected among basic and intermediate studies that support the degree so that the total extent of the degree is at least 180 credits. In the case of optional studies, if necessary, the student must agree with the organizing department for the participation to the course. Optional studies may include practical training in the field of biomedical engineering of up to 5 credits (course code 580120A Practical training I).

Recommended optional studies:

766326A: Atomic physics 1, 6 op
040105Y: Basic Epidemiology, 1,5 op
580201A: Biomedical Engineering Programming Study, 5 op
031077P: Complex analysis, 5 op
757109P: Concepts of genetics, 5 op
811312A: Data Structures and Algorithms, 5 op
521432A: Electronics Design I, 5 op
521145A: Human-Computer Interaction, 5 op
521287A: Introduction to Computer Systems, 5 op
811170P: Introduction to Information Systems Analysis and Design, 6 op
521150A: Introduction to Internet, 5 op
766334A: Nuclear and particle physics, 2 op
031022P: Numerical Analysis, 5 op
555265P: Occupational Safety and Health Management, 5 op
580120A: Practical training 1, 1 - 5 op
031021P: Probability and Mathematical Statistics, 5 op
465075A: Research Techniques for Materials, 3,5 op
763333A: Solid state physics, 4 op
766328A: Thermophysics, 6 op

Master's Degree programme in Medical and Wellness Technology, Master of Health Science (120 ect)

Tutkintorakenteen tila: archived

Lukuvuosi: 2016-17

Lukuvuoden alkamispäivämäärä: 01.08.2016

Complementary Studies (enintään 60 op)

Common studies for all (68 - 71 op)

764664S: Analysis and simulation of biosystems, 6 op
080914S: Biomedical Engineering and Medical Physics Seminar, 3 op
521093S: Biomedical Instrumentation, 5 op

521273S: Biosignal Processing I, 5 op
580101Y: Introduction to University Studies, 2 op
580213S: Master's Thesis in Biomedical Engineering, 30 op
580211S: Maturity Test, 0 op
764634S: Medical physics and imaging, 5 op
580121A: Practical training, 1 - 5 op
521124S: Sensors and Measuring Techniques, 5 op
580214S: Study Plan of the Thesis, 5 op

Advanced Studies (25 - 35 op)

One advanced module will be chosen from which need to be executed at least 25 ECTS credits.

Biomedical Technology

580401A: Basic Biomaterials, 2 op
580402S: Biomedical Imaging Methods, 1 - 5 op
521240S: Biophotonics and Biomedical Optics, 5 op
080917S: Project in Biomedical Technology, 5 - 10 op
465105A: Research techniques for materials, 5 op
761359A: Spectroscopic methods, 5 op
080915S: Tissue Biomechanics, 5 op
040911S: Using animals in research - carrying out procedures, 3 op

Medical Imaging

580402S: Biomedical Imaging Methods, 1 - 5 op
521282S: Biosignal Processing II, 5 op
521259S: Digital Video Processing, 5 op
521289S: Machine Learning, 5 op
521466S: Machine Vision, 5 op
080918S: Project in Medical Imaging, 5 - 10 op
521149S: Special Course in Information Technology, 5 - 8 op

Health technology

080916S: Biomechanics of Human Movement, 5 op
521282S: Biosignal Processing II, 5 op
521430A: Electronic Measurement Techniques, 6 op
040404A: Health technology and rehabilitation, 5 op
521145A: Human-Computer Interaction, 5 op
555333S: Production Management, 5 op
080919S: Project in Health Technology, 5 - 10 op

Optional studies (11 - 29 op)

Optional studies are selected among the intermediate and advanced studies that support the degree (so that the total extent of the degree is at least 120 credits). In the case of optional studies, if necessary, the student must agree with the organizing department for the participation for the course. Optional studies may include practical training in the field of biomedical engineering of up to 4 credits (580121A Practical training 2).

Recommended studies:

Biomedical Technology

521285S: Affective Computing, 5 op
580202S: Biomedical Engineering Project, 5 op
521240S: Biophotonics and Biomedical Optics, 5 op
521282S: Biosignal Processing II, 5 op
764322A: Cell membrane biophysics, 10 op
764629S: Identification of linear systems, 5 op

747604S: Introduction to biocomputing, 3 op
521149S: Special Course in Information Technology, 5 - 8 op

Medical Imaging

521285S: Affective Computing, 5 op
580201A: Biomedical Engineering Programming Study, 5 op
580202S: Biomedical Engineering Project, 5 op
521240S: Biophotonics and Biomedical Optics, 5 op
521412A: Digital Techniques 1, 6 op
521432A: Electronics Design I, 5 op
031044A: Mathematical Methods, 4 op
766661S: NMR Imaging, 8 op
580121A: Practical training, 1 - 5 op

Health technology

521285S: Affective Computing, 5 op
580201A: Biomedical Engineering Programming Study, 5 op
521412A: Digital Techniques 1, 6 op
521432A: Electronics Design I, 5 op
031044A: Mathematical Methods, 4 op
521238S: Optoelectronic Measurements, 4 op
464085A: Patenting, 3,5 op
555242A: Product development, 5 op
812671S: Usability Testing, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

902153Y: English for Medical Technology, 1,5 - 3 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

Proficiency level:
B2/C1
Status:
Compulsory course
Required proficiency level:
Students are expected to have had English as their A1 or A2 language at school or have acquired equivalent skills.
ECTS Credits:
3 ECTS
Language of instruction:
English
Timing:
1st year
Learning outcomes:

Having completed the course, students will be able to

- understand and use relevant medical and technical vocabulary in professional and academic setting,
- use English in short professional communication, both spoken and written,
- respond appropriately and convincingly to the contribution of others in a professional and/or academic setting,
- summarize academic/scientific texts related to medical technology,

give a presentation on a professional or academic topic related to their field.

Contents:

The course material and communicative tasks cover the following topics:

- basics of medical terminology
- organisation of health care institutions
- devices and tools in health care
- technical description of certain devices in medical technology
- recent innovations in medical technology
- professional and academic organisations and forums in medical technology

Mode of delivery:

Contact and online teaching

Learning activities and teaching methods:

-

Target group:

Students in the degree programs of medical technology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Specific texts and material prepared by the teacher. Information will be provided at the beginning of the course. Material will be available in Optima during the course.

Assessment methods and criteria:

The course requirements include active participation in classroom work and tutorial (24 hrs) and completion of home assignments (Reading journal and glossary: 20 hrs), presentation of self-selected literature (16 hrs), writing task (20 hrs). Alternatively, an end-of-course examination may be offered. Some course work can be completed online.

Grading:

The evaluation scale is on a scale of 0-5 (hyl/hyv).

Person responsible:

Eva Braidwood

Working life cooperation:

-

Other information:

Students with the matriculation exam grade laudatur or eximia cum laude approbatur are exempted from the first part of the course but need to demonstrate summarizing skills and knowledge of basic medical vocabulary, which they can acquire autonomously using the online material provided by the teacher. Alternatively, they can participate in the first part, too. The same applies to those who have graduated from an IB–program or other English medium secondary education.

580101Y: Introduction to University Studies, 2 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

2 ECTS credit points / 54 hours of work

Language of instruction:

Finnish or English

Timing:

1st year, 1st period

Learning outcomes:

After the course the student

1. identifies the most important departments, organizations and associations related to studying and knows their function and services
2. identifies the essential features for university studies and study planning in the field of medical and wellness technology
3. identifies ones path of studies

Contents:
University studies. University and the learning environment, aims of the studies, structure and content, working methods, services provided for students. How to plan studies and making a personal study plan (PSP). Study groups.
Mode of delivery:
Face-to-face-teaching
Learning activities and teaching methods:
Tutor and tutor teacher meetings, drawing the personal study plan, and discussion with the PSP advisor, total 54 hours.
Target group:
1st year students of Medical and Wellness Technology and students of Master of Health Science programme, 1st period
Assessment methods and criteria:
Taking part into group meetings, making a personal study plan. Personal study plan discussion about with the study advisor.
Grading:
The course utilizes verbal grading: pass or fail
Person responsible:
Tutors, study advisor
Working life cooperation:
No

040012Y: Knowledge and Research, 3,5 - 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Pentti Nieminen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay040012Y Knowledge and Research (OPEN UNI) 3.5 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
3,5 ECTS
Timing:
1 st and 2 nd year
Learning outcomes:
The student knows the role of scientific publications, can use and evaluate information sources critically.
The student is familiar with statistical computing in the fields of medicine, dentistry and health sciences. Further, the student is able to analyze data with basic statistical methods, use basic statistical significance tests and inference methods, and evaluate critically scientific research reports.
Contents:
Scientific communication:
Scientific journals, research articles, critical evaluation of research findings, ethics in scientific publication, study planning, study designs, reporting.
Statistical methods:
Aims and phases of statistical research, planning statistical research, obtaining data, variable distributions (frequencies, graphs and statistics), basics in statistical inference and methods (estimates, significance tests and confidence limits), basic methods in comparing groups and estimating associations between variables, specific methods applied in medical research.
Mode of delivery:
Blended teaching
Learning activities and teaching methods:

040012Y-05 (1,5 ECTS Knowledge Management and Research, Lessons and written examination
040012Y-06 (1,0 ECTS) Knowledge Management and Research, Small group exercises
040012Y-07 (1,0 ECTS) Knowledge Management and Research, Practical project

Target group:
Medical, dental and medical wellness technology students
Prerequisites and co-requisites:
Knowledge Management and Research I
Recommended or required reading:
Material in lessons small group lessons.
Uhari M ja Nieminen P: Epidemiologia ja biostatistiikka. Second Edition. Duodecim, 2012.
Assessment methods and criteria:
Regular and active participation in the small group lessons and completion of practical projects. Written examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail
Person responsible:
Senior lecturer Pentti Nieminen
Working life cooperation:
No

901043Y: Second Official Language (Swedish), Oral Skills, 2 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Opintokohteen kielet: Swedish

901042Y: 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

040901Y: Basic Anatomy, 1,5 - 2 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Katri Veijola

Opintokohteen kielet: Finnish

ECTS Credits:
2 credits
Language of instruction:
Finnish
Timing:
1st Spring
Learning outcomes:
After this course student is familiar with the basic anatomy of the human body.
Learning activities and teaching methods:

Lectures 20 h. Final exam
Recommended or required reading:
Material given in the lectures.
Assessment methods and criteria:
Written exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 or fail.
Other information:
Students have to register according to the instructions of the study advisor.This course is organized by the open university.

761111P: Basic mechanics, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761118P	Mechanics 1	5.0 op
761118P-02	Mechanics 1, lab. exercises	0.0 op
761118P-01	Mechanics 1, lectures and exam	0.0 op
ay761111P	Basic mechanics (OPEN UNI)	5.0 op
761101P	Basic Mechanics	4.0 op

ECTS Credits:
5 credits
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 28 h, 7 exercises (14 h), 2 laboratory exercises (8 h), 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 1-14. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
Course material availability can be checked here.

Assessment methods and criteria:
Three mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Anita Aikio
Working life cooperation:
No work placement period
Other information:
https://noppa.oulu.fi/noppa/kurssi/761111P/etusivu

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Lusikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031010P Calculus I (OPEN UNI) 5.0 op

ECTS Credits:
5
Language of instruction:
Finnish
Timing:
Autumn semester, periods 1-3.
Learning outcomes:
After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student 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 55 h / Group work 22 h.
Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Grossmann, S.I.: Calculus of One Variable; Grossmann, 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:
Numerical grading scale 1-5.
Person responsible:
Ilkka Lusikka
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: Ilkka Lusikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031075P Calculus II (OPEN UNI) 5.0 op

031011P Calculus II 6.0 op

ECTS Credits:
5
Language of instruction:
Finnish
Timing:
Spring, period 3
Learning outcomes:
The course gives the basics of theory of series and differential and integral calculus of real and vector valued functions of several variables. After completing the course the student is able to examine the convergence of series and power series of real terms. Furthermore, the student can explain the use of power series e.g. in calculating limits and 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 28 h.
Target group:
-
Prerequisites and co-requisites:
The recommended prerequisite is the completion of the course Calculus I.
Recommended optional programme components:
-
Recommended or required reading:
Kreyszig, E.: Advanced Engineering Mathematics; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations.
Assessment methods and criteria:
Intermediate exams or a final exam.
Grading:
Numerical grading scale 1-5.
Person responsible:
Ilkka Lusikka
Working life cooperation:
-
Other information:
-

050004Y: Chemistry, 3 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Karppinen, Peppi Leena Elina

Opintokohteen kielet: Finnish

ECTS Credits:
3 ECTS
Language of instruction:
Finnish
Timing:
The course unit is held in the spring term.
Learning outcomes:
After finishing the module student should have a basic knowledge concerning chemistry.
Contents:

General and inorganic chemistry: Basic concepts of chemistry; structure of atom; chemical bond; chemical formula, reaction and equations, stoichiometry; thermodynamics; phase equilibrium; reaction kinetics; chemical equilibrium; acid/base equilibrium; electrochemistry. Organic chemistry: nomenclature of organic compounds; carbon bonds; stereochemistry; properties and reactions of organic compounds.
Mode of delivery:
Lectures, tutorial teaching, exam.
Learning activities and teaching methods:
Lectures 26 h, practice of calculations 6 h. Exam.
Target group:
Students of Medical and Wellness Technology.
Recommended or required reading:
Murray, R.K. (ed.): Harper's Illustrated Biochemistry, 28th edition, 2009.

R. Laitinen ja J. Toivonen: Yleinen ja epäorgaaninen kemia, soveltuvin osin. Otakustantamo. Harold Hart: Organic Chemistry. A short Course, Houghton Mifflin Company, 6. (1983) or updated edition.

Assessment methods and criteria:
Chemistry course includes 1 exam (4 essays, 0-2.5 p/essay, points needed for passing 4.75).

Read more about assessment criteria at the University of Oulu webpage.
Grading:
Accepted/Fail.
Person responsible:
Professor Johanna Myllyharju

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

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031076P	Differential Equations (OPEN UNI)	5.0 op
800320A	Differential equations	5.0 op
031017P	Differential Equations	4.0 op

Ei opintojaksokuvauksia.

761113P: Electricity and magnetism, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761119P	Electromagnetism 1	5.0 op
761119P-01	Electromagnetism 1, lectures and exam	0.0 op
761119P-02	Electromagnetism 1, lab. exercises	0.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

ECTS Credits:
5 credits
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:
Spring
Learning outcomes:
The student is able to describe the basic concepts of electricity and magnetism and to apply those when solving the problems related to electromagnetism.
Contents:
Electromagnetic interaction is one of the four fundamental interactions in physics and many phenomena like light, radio waves, electric current, magnetism and formation of solid matter are based on electromagnetism. The current technological development is largely based on applications of electromagnetism in energy production and transfer, telecommunications and information technology.
Contents in brief: Coulomb's law. Electric field and potential. Gauss's law. Capacitors and dielectrics. Electric current, resistors, electromotive force and DC circuits. Magnetic field, motion of a charged particle in electric and magnetic fields, and applications. Ampère's law and Biot-Savart law. Electromagnetic induction and Faraday's law. Inductance and inductors. R-L-C circuits, alternating current and AC circuits.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30 h, 6 exercises (12 h), 2 laboratory exercises (8 h), 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 are needed.
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 21-31. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
Course material availability can be checked here.
Assessment methods and criteria:
Three mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Anita Aikio
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/761113P/

521141P: Elementary Programming, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Rautiainen, Mika Oja

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521141P Elementary Programming (OPEN UNI) 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5
Language of instruction:
Lectures and learning material are in Finnish. The course can be completed in English by self-studying from a book, completing assignments and exercises on the course learning environment, and delivering a final project.
Timing:
Fall, period 1. There is an option to extend the course to the 2nd period in cases where completing in one period doesn't fit the student's schedule.
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:
-

764125P: Foundations of cellular biophysics, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

764115P Foundations of cellular biophysics 4.0 op

ECTS Credits:
5 credits
Language of instruction:
Finnish
Timing:
2nd spring
Learning outcomes:
After finishing the course the student is able to describe the foundations or basics of cellular structure and function, to present the biophysical background for some of these, and to solve simple problems and calculations concerning cellular biophysics and -chemistry. In addition, the student can specify and categorize some of the central fields of cell biology and cellular biophysics.
Contents:
In this course cellular function is considered from the point of view of biophysics. The course concentrates on the subjects of energy metabolism, information transfer, and the cellular structures and features that are biophysically interesting. The course contains, for instance, the introduction to the physical chemistry of the cells, the structure of cell and cell membrane (some basic cell biology), cellular energy sources and metabolism, cellular trafficking, kinetics of enzyme reactions, basics of cell membrane function and transportation phenomena, some introduction into the electrical phenomena of the cell membrane and the basics of cellular information processing.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 24 h, calculation exercises 9 h, self-study 100 h
Target group:
Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Introduction to biophysics (764103P) is recommended to be done before this course.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lecture handouts; P.J. Antikainen, Biotieteiden fysikaalista kemiaa, WSOY, Helsinki 1981 (partly); J. Heino and M. Vuento, Solubiologia, WSOY, Porvoo 2002 (partly). Since the books are in Finnish, some corresponding literature can be discussed upon with the lecturer. Course material availability can be checked here.
Assessment methods and criteria:
Home exam, final exam Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

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

Opintokohteen kielet: Finnish

Leikkaavuudet:

764163P-01 Introduction to Biomedical Physics (part 1) 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 credits *(part 1, Introduction to biophysics 2 credits and part 2, Basic biophysics 3 credits)*
Language of instruction:
Finnish
Timing:
Part 1: 1st autumn
Part 2: 1st spring
Learning outcomes:
Student can describe and explain some basics and concepts of certain areas of biophysics and knows central targets of biophysical research.
Contents:
The course introduces some basic biological processes from biophysics point of view, and describes so called systems thinking, biophysics and its methods, models and system analysis; for example basics of cellular and molecular biophysics, fluid flow phenomena, biomechanics and some other special issues.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Part 1: Lectures 14 h, self-study 39 h
Part 2: Lectures 20 h, final exam, 46 h of independent studies
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:
Part 1: Lectures and lecture notes
Part 2: Lectures, lecture notes.
Assessment methods and criteria:
Part 1: Exam
Part 2: Exam
Both parts of the course have their own separate examinations. The final grade of the course is the weighted average of the grades of part 1 (2 cp) and part 2 (3 cp).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

Compulsory

764163P-01: Introduction to Biomedical Physics (part 1), 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

764163P Basic biophysics 5.0 op
764103P Introduction to biophysics 2.0 op
764162P Introduction to biophysics 3.0 op

Ei opintojaksokuvauksia.

764163P-02: Introduction to Biomedical Physics (part 2), 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

764163P	Basic biophysics	5.0 op
764103P	Introduction to biophysics	2.0 op
764162P	Introduction to biophysics	3.0 op

Ei opintojaksokuvauksia.

580102P: Introduction to Medical and Wellbeing Technology, 5 op

Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credit points / 135 hours of work
Language of instruction:
Finnish
Timing:
1st year 2nd and 3rd periods
Learning outcomes:
The student can define areas of medical technology and can list technological innovations used in these fields. The student can describe milestones in medical technology from history to present time.
Contents:
Practical examples of medical and wellness technology, introducing terms. Group work based on the material given and presenting the results. Includes also material introduced during theme day.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures, demonstrations and excursions 30h / Group work and theme day 30h / Self-study 75h. Final exam or assignment.
Target group:
1st year students of Medical and Wellness Technology, minor subject students
Recommended or required reading:
Material given during the lectures
Assessment methods and criteria:
Participating in the contact teaching, group work and theme day. Final exam or assignment.
Grading:
The course utilizes grading: pass or fail
Person responsible:
Professor Timo Jämsä

766106P: Laboratory exercises in physics 2, 4 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761120P	Laboratory Exercises in Physics 2	5.0 op
761107P	Laboratory Exercises in Physics I	6.0 op
766107P	Laboratory exercises in physical sciences	6.0 op

ECTS Credits:
4 credits
Language of instruction:
Finnish
Timing:
1. spring - 3. autumn
Learning outcomes:
After completing the course, the student can rather independently work with the most important measuring instruments used in physics and has experience in planning and conducting different measurements. The student is also able to critically assess her/his own results and report them to a group of peers.
Contents:
The laboratory exercises (1/3 – 1/2 ECTS per exercise) train the student in applying measurements to research into different physical phenomena. The exercises include practising how to plan the measurements, learning how to use the measuring instruments, processing and assessing the results, and drawing up scientific reports. Some of the exercises can be chosen according to the student's own interest. Half (2 ECTS) of the exercises take place in the teaching laboratory and the other half (2 ECTS) in the research laboratories of the department's research groups. Minor subject and physics teacher students may substitute some or all of the research laboratory exercises by teaching laboratory exercises.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Per one exercise, 4 h of measurements in the laboratory and 5 – 9 h of preparation and drawing up a report independently.
Target group:
No specific target qroup
Prerequisites and co-requisites:
Recommended: 761121P Laboratory exercises in physics 1.
Recommended optional programme components:
Each exercise is closely related to a basic or intermediate course in physics, because the phenomena connected to the measurements and their theory are discussed in the lectures for the courses.
Recommended or required reading:
The exercise work instructions and guidelines for the work report, which can be found on the website of the course.
Assessment methods and criteria:
Adequate familiarization with the phenomenon under scrutiny and the measurements before the exercise (oral or written questions), successfully completing the guided measurements, reporting on the exercise (the work report will be graded).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Seppo Alanko
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/766106P/

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

Ei opintojaksokuvauksia.

040902Y: Medical Biochemistry and molecular biology, 8 - 9 op

Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Karppinen, Peppi Leena Elina
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

766116P: Radiation physics, biology and safety, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P	Radiation physics, biology and safety	3.0 op

ECTS Credits:
5 credits
Language of instruction:
Finnish
Timing:
2nd or 3rd spring
Learning outcomes:
After finishing the course the student is able to describe the physical mechanisms giving rise to different kinds of radiation and explain the essential effects of ionising radiation function on biological organisms. In addition, the student remembers the essential features of radiation safety and laws and regulations (in Finland) concerning this.
Contents:
The topics of the course include the origin of ionizing radiation e.g. as a result of radioactive decay and in nuclear reactions, the interaction between radiation and matter, the detection and measurements of radiation, physical quantities and measuring units related to radiation, radiation in the environment, and examples of utilizing radiation. The biologic effects of radiation and the legislation on radiation safety are also discussed.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 26 h, exercises 8 h, laboratory exercises 8 h, self-study 91 h
Target group:
Primarily for the students of the degree programme in physics. 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:
Lecture notes, required law texts (in Finnish)
Assessment methods and criteria:
One written exam
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Seppo Alanko
Working life cooperation:
No work placement period
Other information:
https://noppa.oulu.fi/noppa/kurssi/766116p/etusivu

Compulsory

766116P-01: Radiation physics, biology and safety, exam, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P Radiation physics, biology and safety 3.0 op

Ei opintojaksokuvauksia.

766116P-02: Radiation physics, biology and safety, laboratory exercises, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P Radiation physics, biology and safety 3.0 op

Ei opintojaksokuvauksia.

761114P: Wave motion and optics, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761310A Wave motion and optics 5.0 op

761310A-01 Wave motion and optics, lectures and exam 0.0 op

761310A-02 Wave motion and optics, lab. exercises 0.0 op

761104P Wave Motion 3.0 op

ECTS Credits:
5 credits
Language of instruction:
Lectures and exercises in Finnish. Material in English.
Timing:
Spring
Learning outcomes:
The student can classify different types of wave motions and can name the characterizing quantities (wavelength, period, wave speed), can apply geometrical optics to simple mirror and lens systems, can explain the meaning of interference and diffraction and their applications, like using interference to determine wavelength of radiation.
Contents:
Basic course on wave motion, and geometric and wave optics.
Wave motion and propagation. Acoustics. Geometric optics: basic principles, mirrors and lenses. Electromagnetic waves. Wave optics: interference, diffraction, and polarization. Optical instruments. Photometry. Laser.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30 h, exercises 10 h, 2 laboratory exercises (8 h), self-study 85 h
Target group:
The 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:
Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2008. Also earlier editions can be used.
Course material availability can be checked here.
Assessment methods and criteria:
Three mini examinations and one end examination or a final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Saana-Maija Huttula
Working life cooperation:
No work placement period
Other information:
https://noppa.oulu.fi/noppa/kurssi/761114p/etusivu

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 credit points / 135 hours of work
Language of instruction:
English

Timing:
2nd period
Learning outcomes:
The student can define central information and communication technological 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
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, radiologypsychiatry, teleradiology, telepsychiatry
- economical and functional assessment
- remote education
- future visions of health care information systems
Mode of delivery:
Web-based teaching
Learning activities and teaching methods:
Interactivity takes place in virtual learning environment Optima. The course consists of video-taped lectures, power point-presentations and links to other material available in the web. Performance of duties includes an essay, exam, participating in discussions on the grounds of the lectures.
Web lectures 15h / Web exam 40h / Written essay 40h / Self-study and participation to web discussion 40h
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineering, biophysics, other degree programs), Students of Health Sciences and information technology and everyone who is interested
Recommended or required reading:
All recommended or required reading are offered in Optima virtual learning environment
Assessment methods and criteria:
Web tasks, an essay and final exam
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Jarmo Reponen
Working life cooperation:
No
Other information:
Recommended literature:
Graig J Wootton R, Patterson V (Eds): An introduction to
Telemedicine,RSM Press 2006
Hämäläinen P, Reponen J, Winblad I, Kärki J, Laaksonen M, Hyppönen H, Kangas M (2013) eHealth and eWelfare of Finland, Check point 2011. THL Report 5/ 2013.
(https://www.julkari.fi/bitstream/handle/10024/104368/URN_ISBN_978-952-245-835-3.pdf?sequence=1)
Saranto K, Korpela M (toim) Tietotekniikka ja tiedonhallinta sosiaali-
ja terveydenhuollossa, WSOY, Porvoo-Helsinki-Juva 1999
Reponen J, Kangas M. Hämäläinen P, Keränen N (2015) Tieto- ja viestintäteknologian käyttö terveydenhuollossa vuonna 2014. Tilanne ja kehityksen suunta. [English summary] THL Raportteja 12/2015.
(http://www.julkari.fi/bitstream/handle/10024/126470/URN_ISBN_978-952-302-486-1.pdf?sequence=1)

Journals:
Journal of Telemedicine and Telecare
Telemedicine and e-Health
In addition: eLibrary in the Optima comprising updating of the topics of the lectures and some selected essays (by permission of the author)

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:
-

521337A: Digital Filters, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521337A	Digital Filters (OPEN UNI)	5.0 op

ECTS Credits:
5
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:
Esa Rahtu
Working life cooperation:
None.

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.

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

ECTS Credits:
5 ECTS credit points / 135 hours of work
Language of instruction:
Finnish
Timing:
1st and 2nd periods
Learning outcomes:
The student can identify technologies in different fields of medical technology, can describe the 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 equipment and methods are presented. Expert lecturers on other current topics related to the course.

Mode of delivery:

Face-to-face teaching
Learning activities and teaching methods:
Initial exam. Lectures 35 h / Demonstrations 10 h / Course assignment and self-study 90 h. Final exam which is based on lectures and all given materials.
Target group:
Bachelor students interested in Biomedical Engineering (medical technology, information technology, electrical engineering, physics, other related degree programs).
Recommended or required reading:
T.Sora, P. Antikainen, M. Laisalmi, S. Vierula: Sairaanhoidon teknologia, WSOY 2002[MH1] .
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 (literature for the initial exam: T. Sora, P. Antikainen, M. Laisalmi, S. Vierula: Sairaanhoidon teknologia, WSOY 2002). Taking part in the lectures and demos. Learning assignment. Final exam with essay-type questions. In order to participate in the final exam the student must have passed 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 grade of 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.

040112A: Physiology, 15 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Vuolteenaho, Olli Jaakko Tuomas

Opintokohteen kielet: Finnish

ECTS Credits:
15 ECTS credits /402 hours of work
Language of instruction:
Finnish. Some lectures, a practical and some of the term papers in English.
Timing:
The course unit is held in the autumn semester. The course must be completed during the first two years of the Medical School curriculum
Learning outcomes:
After completion of the course the student:
- knows the principles of the function, regulation, and interrelations of the cells, tissues and organ systems of the healthy human being, as required for independent work as a physician or dentist
- can evaluate the knowledge and apply it for investigations of clinical physiological problems and mechanisms of diseases
- can follow and evaluate the development of physiology as a science, and maintain and improve knowledge in it
- can apply knowledge in physiology for acquiring, evaluating and reporting scientific medical and dental information
After reaching the learning aims the student has sufficient knowledge and skills in physiology for studies leading to the degrees of Licenciate of Medicine and Licenciate of Dentistry, and for continuous learning.
Contents:
1. Cell physiology
2. Fundamentals of Biophysics
3. Organ physiology
4. Physiological regulation and integrative physiology
5. Applied physiology
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:

Guidance and tutorial (3 h), lectures (106 h), practicals (38 h), term paper (2 h), interim and final examinations (8 h), independent study (245 h).

Target group:
Second year medical and dental students.

Prerequisites and co-requisites:
The student should have completed the courses of Anatomy, Cell Biology, and Medical Biochemistry & Molecular Biology.

Recommended optional programme components:
-

Recommended or required reading:
- Ganong's Review of Medical Physiology (most recent edition).
- Practicals Textbook (in Finnish): Fysiologian harjoitustyöt (Oulun yliopiston oppimateriaalia-sarja, Lääketiede D, most recent edition).
- Lecture notes can be found in Optima Environment (http://optima.oulu.fi).
The availability of the textbook in the library can be checked here.

Assessment methods and criteria:
At the beginning of the course there is an examination on the subject of the practicals, which has to be passed. In the middle of the course there is an interim examination on the course contents 1-3, and at the end the final examination. The student has to obtain one third of the maximum points to pass these examinations. Detailed requirements can be found during the course period in the Optima Environment (http://optima.oulu.fi).

Grading:
The course unit utilizes a numerical grading scale 1-5. Zero stands for a fail.

Person responsible:
Professor Olli Vuolteenaho

Working life cooperation:
No

compuls12

040112A-01: Physiology, small group teaching, 2,5 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 0,0 - 99,9
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-011: Physiology, biophysics small group teaching, 0,5 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-021: Physiology, practicals entry examination, 1 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit

Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-02: Physiology, term paper, 2 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 0,0 - 99,9
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-03: Physiology, mid-term examination, 3 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 0,0 - 99,9
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-04: Physiology, final examination, 6 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 0,0 - 99,9
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish
Leikkaavuudet:

040102A-10 Final exam 0.0 op

Ei opintojaksokuvauksia.

521431A: Principles of Electronics Design, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Häkkinen
Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Finnish.
Timing:
Spring, period 4
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, operational amplifier, 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.
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, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 1-8 and 15 partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 1-5 and 14.
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 Häkkinen
Working life cooperation:
-

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 1.

Learning outcomes:
The objective of the course is to familiarise the student with the basics and the basic methods of project management. Upon completion the student can explain the essential concepts related to project management. He /she can present the main features of a project plan and can use different methods of partitioning a project. The student can also schedule a project and estimate its costs. The student can explain the terms related to Earned value method and can apply the method on simple tasks. Upon completion the student recognizes the essential tasks of project risk management.

Contents:
Defining project management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management, project stakeholder 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 or 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:
The course includes three mandatory 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:
Professor Jaakko Kujala.

Working life cooperation:
No.

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

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

Ei opintojaksokuvauksia.

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:
English
Timing:
Bachelor studies, 2nd period
Learning outcomes:
The students will learn how to construct software environments for measurements and data analysis.
Contents:
The course gives basic skills to use MATLAB and LabView programming environments to construct their own (custom) programs, with which they can both measure and analyze data with the computer.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 10 h, project work 60 h, self-study 65 h
Target group:
Bachelor students of Medical Technology and Biophysics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Basic skills in programming.
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. The grading is based on projects.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
None

580209A: Bachelor's Thesis, 10 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.

Language of instruction:
Finnish or English
Timing:
3rd year
Learning outcomes:
The student is able to describe a research problem or need arisen in development work, to solve it on the grounds of acquired knowledge and skills and to report it both in written and oral form.
Contents:
Research or development project in the field of medical & wellness technology. Planning, writing and reporting of the thesis. Presenting the thesis at the seminar and participating in the group meetings.

Mode of delivery:
Independent work
Learning activities and teaching methods:
Independent work with the help of a supervisor. The student must agree in advance on topic and contents with the responsible person of the degree programme. Thesis can be made in different research groups of the university, in industry or health care system.
Target group:
Bachelor Students of Medical and Wellness Technology

Assessment methods and criteria:
Writing the thesis, an oral presentation at the seminar and participating in the group meetings.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
Thesis can be made for a company.
Other information:
It is recommended that before starting the bachelor's thesis the student has at least 120 ECTS cr.

580211A: Maturity Test, 0 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
0 ECTS
Language of instruction:
Finnish or Swedish.
Timing:
After completion of the bachelor's thesis.
Learning outcomes:
The student can produce mature text in popular form of the research field and thus show ones familiarity to the field.
Contents:
Depends on the topic of the thesis.
Mode of delivery:
Literary work.
Learning activities and teaching methods:
Takes place after bachelor's thesis. Written based on a given topic considering the thesis.
Target group:
Bachelor Students of Medical and Wellness Technology
Recommended optional programme components:
Will be written after the Bachelor's Thesis has been submitted for review.
Assessment methods and criteria:

Student writes an essay in his/her native language about the topic of the Bachelor’s thesis to show a good command of the language and the content of the thesis

Grading:
Pass or fail. Both the contents and language are assessed.
Person responsible:
Professor Timo Jämsä

766326A: Atomic physics 1, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761313A	Atomic physics 1	5.0 op
761326A	Atomic physics	6.0 op
761105P	Atomic and Nuclear Physics	3.0 op

ECTS Credits:
6 credits
Language of instruction:
Finnish
Timing:
Second autumn term
Learning outcomes:
Student can list differences between the classical and quantum mechanical concepts, and the limitations of classical physics, when investigating atom-sized particles. Student is able to describe some interaction mechanisms of electromagnetic radiation and matter. Student can describe the principles used when the wave functions and energies of some simple systems are determined. Student can take advantage of the periodic table of elements in finding the chemical and physical properties of atoms based on its electronic structure. Student can explain the physical conditions necessary when molecular bonds are created and can describe the basics of vibrational, rotational and electronical energy states of molecules.
Contents:
The quantum mechanics is one of the important theories of modern physics. Quantum mechanical theory has changed our understanding of the universe, especially the nature of matter and radiation. In the atom physics course, the quantum mechanics is examined with the aid of simple examples. The quantum mechanical phenomena occur only when investigating the microscopical elements of matter, i.e. atoms, electrons and nuclei. In the beginning of the course, the historical events which led to the development of the quantum mechanics in the early 20th century are discussed. In this context, the interaction processes between matter and electromagnetic radiation, like black-body radiation, the photoelectric effect, and scattering, are examined. In quantum mechanics, particles are usually described with the aid of wave functions. De Broglie wavelength, the group and phase velocities of particles, and Heisenberg uncertainty principle serve as introduction to the wave properties of particles. The Bohr's atomic model, electronic transitions of atoms, and emission spectra of atoms are also discussed in the first part of the atom physics course.
The second part of the course goes deeper into the quantum mechanics. The solution of wave functions and energies for some simple systems, like hydrogen atom, are described. Additionally, many-electron atoms, molecules, and chemical bondings of atoms are discussed briefly. Some modern research methods which are used to study the atomic and molecular physics are introduced. Applications which exploit the atom physical phenomena in everyday life are also discussed.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 40 h, exercises 20 h, self-study 100 h
Target group:
No specific target qroup
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:
Books: A. Beiser: Concepts of Modern Physics, McGraw-Hill Inc., R. Eisberg and R. Resnick: Quantum physics of atoms, molecules, solids, nuclei and particles, John Wiley & Sons.
Course material availability can be checked here.
Assessment methods and criteria:
Two written intermediate examinations or one final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Saana-Maija Huttula
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/766326A/

040105Y: Basic Epidemiology, 1,5 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Jaakkola

Opintokohteen kielet: Finnish

ECTS Credits:
1.5 ECTS (Basics of Epidemiology)
Language of instruction:
English
Timing:
During the second year, spring semester (C4)
Learning outcomes:
Upon completion of the course students will understand the basic epidemiologic thinking / basic concepts of epidemiologic
methods in medical and health sciences and know the types of epidemiologic studies. They are also able to calculate measures of disease occurrence, use measures of effect to estimate the association between a given exposure and dis-ease and are able to define the concept of confounding and know how to apply it in professional practice.

Contents:
Structure of the Course:
- 1. Introduction to epidemiology; causation
- 2. Measures of disease occurrence and effect
- 3. Types of epidemiologic studies: cohort studies
- 4. Types of epidemiologic studies: case-control studies
- 5. Biases
- 6. Random error and statistical methods
- 7. Analyzing simple epidemiologic data
- 8. Control of confounding in stratified analysis
- 9. Interaction
- 10. Regression models in epidemiology

In addition, the course includes two exercise sessions conducted in small groups on epidemiologic concepts and methods based on 1) critical reviews of articles and 2) calculation exercises. Students will also individually conduct a critical review of a scientific article.
Mode of delivery:
Face-to-face teaching and independently performed exercise in the Optima environment.
Learning activities and teaching methods:
The course consists of lectures (10 h), two group exercises (3 h each) and one individual exercise (critical evaluation of an article) which is independently performed in the Optima environment.
Target group:

Medical and dental students of the second year.
Prerequisites and co-requisites:
No.
Recommended optional programme components:

The course is linked to C1 – Public health and multiprofessional collaboration (Fundamentals of public health science), C4 – Environmental health, C11 – General practitioner and public health and Environment, Lifestyle and Health (ELH) track. Closely linked to the course in biostatistics delivered during the same term and Evidence based medicine (EBM) track.
Recommended or required reading:
Required reading: lecture notes and Rothman KJ. Epidemiology: and introduction. 2nd edition. Oxford University Press, New York, 2012.
Assessment methods and criteria:
Participation to the group exercises is mandatory and controlled for. The individual exercise is assessed by the teacher. Written final examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5/fail. At least 10 points are required for passing the examination.
Person responsible:
Poat doctoral researcher Taina Lajunen
Working life cooperation:
No.
Other information:
No other information.

580201A: Biomedical Engineering Programming Study, 5 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credit points / 135 hours of work.
Language of instruction:
Finnish or English
Timing:
Bachelor of Master studies, elective course.
Learning outcomes:
The student can design a solution to a programmig problem related to medical technology, can solve the task and report this in written form.
Contents:
Independent computer programming using modern programming tools, a written report.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
Students carry out an assigned programming project individually or in pairs and write out a report.
Self-study or group work 135hours.
Target group:
Student of Medical and Wellness Technology.
Prerequisites and co-requisites:
521141P Basic of Programming, 764627A/S Virtual Measurement Environments or similar knowledge.
Assessment methods and criteria:
The program and the report are assessed by the supervisor.

Grading:
The course utilizes grading: pass or fail.

Person responsible:
Professor Timo Jämsä
Working life cooperation:
No
Other information:
More information on the available topics can be inquired on the teachers of the department.

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

Ei opintojaksokuvauksia.

757109P: Concepts of genetics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Savolainen Outi

Opintokohteen kielet: Finnish

Leikkaavuudet:

757122P	Concepts of genetics for biochemists	3.0 op
753124P	General genetics	4.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work.
Language of instruction:
Finnish.
Timing:
B.Sc. 1 st spring.
Learning outcomes:
To understand and apply basic concepts of genetics, at Mendelian and molecular level.
Contents:
Part 1. Mendelian genetics, including the ideas of quantitative and population genetics. Part 2. Molecular genetics: replication, transcription, translation, genetic code, mutations, repair of DNA. Part 3. Selected topics on developmental genetics, and genetics of health and diseases.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
50 h lectures and seminars, 83 h independent studies, exam.
Target group:
Compulsory to the biology students (5 cr) Biochemistry students: parts 1 and 3 (3 cr) compulsory.
Prerequisites and co-requisites:
Cell biology (750121P) or equivalent knowledge.
Recommended optional programme components:

This course is prerequisite to all other genetics courses.
Recommended or required reading:
Materials are in Optima. Klug et al. 2012. Concepts of Genetics (10. ed). Pearson, 896 p. Alberts, B. et al. 2008: Molecular Biology of the Cell (5. ed). Garland Science Publishing, London, 1268 p.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Homeworks, home exams, lecture diary, exams.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5 / Fail.
Person responsible:
Prof. Outi Savolainen.
Working life cooperation:
No.
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 study year.

Learning outcomes:
After completing the course, the student can describe the concept of algorithm and explain what correctness and time complexity of algorithms
mean. Furthermore, the student is able to explain the design paradigms presented in the course and to describe the complexity classes of relevant sorting algorithms. The student can analyse simple algorithms, i.e. to prove their correctness and evaluate their time complexity. Moreover, the student is able to describe the basic data structures and apply essential graph algorithms. Finally, the student can construct suitable data structures and algorithms for given problems; the student can also justify the choice of a data structure or an algorithm for an application.
Contents:
The concept and analysis of algorithms, sorting and searching algorithms and their complexity, algorithm design paradigms, the concept of data
structure and basic data struc-tures, hash tables, binary search trees, graphs and their algorithms.

Mode of delivery:
Face-to-face teaching.

Learning activities and teaching methods:
Lectures 48h, exercises 21h, assignment (27), independent work 39h.
Target group:
BSc students.
Prerequisites and co-requisites:
Mastery of subject matter of the course “Discrete Structures” is required.

Recommended optional programme components:

Recommended or required reading:
Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, 2nd edition, MIT Press 2001 (or later). From this edition chapters 1–4, 6–13, 15–16, 22–24, Appendix A and B are covered.

Assessment methods and criteria:
Exam and assignment. Exam will be graded 1-5 if accepted. Assignment graded accepted/failed. Final grade will be the same as exam's grade.
Grading:
Numerical scale 1-5 or fail.
Person responsible:
Ari Vesanen
Working life cooperation:
No

521432A: Electronics Design I, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Häkkinen

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Finnish.
Timing:
Autumn, period 1
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

8. should be able to recount the basic principles governing the functions and properties of emitter-coupled logic
Contents:
Frequency response of a transistor amplifier, differential amplifier, feedback, stability and nonidealities of a feedback amplifier, comparator, output stages and power amplifiers, applications of operational amplifier, oscillators, tuned amplifiers and ECL logic.
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, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 10-13-8 and 14, partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 7,8,9,13 and partially 11 and 12.
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 Häkkinen
Working life cooperation:
-

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

Opintokohteen kielet: English

ECTS Credits:
5
Language of instruction:
In English.
Timing:
Autumn, periods 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 (20 h), exercises (20 h), and practical work (95 h). The course is passed with an approved practical work. 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 4 individual exercises throughout the semester: 1: Using questionnaires; 2: Grouping & clustering; 3: Fitts' law; 4: Advanced evaluation & visualisations. Passing criteria: all 4 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:
Jorge Goncalves
Vassilis Kostakos
Working life cooperation:
-

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 in general.
Student is able to implement small programs with the C programming language for general-purpose computers and for 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 (20h), 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. Other material will be announced at the course start.
Assessment methods and criteria:
Students complete the course exercises after lectures, 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 can be found from the course Web pages in Noppa Portal.
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, Mika Rautiainen.
Working life cooperation:
-
Other information:
521287A Introduction to Computer Systems replaces course 521142A Embedded systems programming for electrical engineering students.

811170P: Introduction to Information Systems Analysis and Design, 6 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Information Processing Science DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Iivari, Pekka Toivo Juhani, Hekkala, Riitta Sisko
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay811169P	Introduction to Information Systems Design (OPEN UNI)	6.0 op
811169P	Introduction to Information Systems Design	6.0 op
811169P-01	Introduction to Information Systems Development, exercise work	0.0 op
811169P-02	Introduction to Information Systems Development, exam	0.0 op
811329A	Introduction to information systems design	5.5 op
811329A-02	Introduction to information systems design, exam	0.0 op

Ei opintojaksokuvauksia.

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: Timo Koskela
Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
All materials are in English, lectures are given in Finnish.
Timing:
Spring, period 4.
Learning outcomes:
1. is able to explain the design principles, architecture, functionality and challenges of the public internet

2. understands data link layer's role and most important access network technologies

3. is able to explain the structure and most important protocols of the TCP/IP protocol stack

4. knows most important internet applications and their protocols

5. understands the principles of internet security and multimedia applications

6. is able to solve simple internet related problems

7. is able to program a small internet application
Contents:
Internet’s design principles and architecture, 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 32 h / problem solving exercises 14 h / laboratory exercises 12 h / course work 25 h / self-study 52 h. Problem solving exercises, laboratory exercises and course work are completed as group work.
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:
-
Recommended or required reading:
Announced at the beginning of the course.
Assessment methods and criteria:
The course uses continuous assessment so that there are 3 intermediate exams. Alternatively, the course can also be passed with a final exam. The course includes a mandatory course work.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course uses numerical grading scale 1-5.
Person responsible:
Dr. Timo Koskela.
Working life cooperation:
-

766334A: Nuclear and particle physics, 2 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766344A	Nuclear and particle physics	5.0 op
766330A-02	Structure of matter, part 2: Nuclear and particle physics	0.0 op
766330A-01	Structure of matter, part 1: Solid state physics	0.0 op
766330A	Structure of matter	6.0 op

ECTS Credits:
2 credits
Language of instruction:
Finnish
Timing:
Second spring term
Learning outcomes:
The student can explain the basic principles of nuclear and particle physics and can derive their consequences in the extent and level of the lectures (see Contents). In addition, he/she can solve problems which require profound understanding of the essential contents of the course.
Contents:
The content of the course is equivalent to the content of part 2 of the course 766330A Structure of Matter.
Person responsible:
Juhani Lounila

031022P: Numerical Analysis, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Marko Huhtanen

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Finnish
Timing:
Spring semester, periods 4-5
Learning outcomes:
The student recognizes what numerical solution methods can be used to solve some spesific mathematical problems, can perform the required steps in the numerical algorithm and is able to perform the error analysis.

Contents:
Numerical linear algebra. Numerical methods for systems of equations, Basics of the approximation theory. Numerical quadratures. Numerical methods for ordinary and partial differential equations.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 44 h / Group work 22 h.
Target group:
-
Prerequisites and co-requisites:
The recommended prerequisite is the completion of the courses Calculus I and II, Differential Equations and Matrix algebra.
Recommended optional programme components:
-
Recommended or required reading:
J. Douglas Faires and Richar L. Burden, Numerical methods; Alfio Quarteroni, Riccardo Sacco, Fausto Saleri, Numerical mathematics
Assessment methods and criteria:
Intermediate exams or a final exam.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 1-5.
Person responsible:
Marko Huhtanen
Working life cooperation:
-
Other information:
-

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

Required proficiency level:

ECTS Credits:
5,0 ECTS credits.
Language of instruction:
Finnish. English material is also used.
Timing:
Periods 3-4.
Learning outcomes:
After the course the student is capable of explaining basic terms of occupational safety and health. He/she is able to assess the importance of occupational safety, health and well-being at work. In addition, he/she is able to assess the significance of occupational safety in the improving of productivity and quality. He/she can apply different safety analysis. Upon completion of the course the student is familiar with the 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 / 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:
Lecture materials. Other materials will be defined during the course.

Assessment methods and criteria:
The grading is based on the exam (50 % of the grade) and exercises (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:
Henri Jounila

Working life cooperation:
No.

Other information:
Substitutes courses 555260P Basic Course in Occupational Safety and Wellbeing at Work + 555263A Technology, Society and Work.

580120A: Practical training 1, 1 - 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
1-5 ECTS credits/ 27-135 hours of work
Language of instruction:
Finnish / English
Timing:
The course can be taken in autumn or spring semester, or during the summer period. It is recommended to complete the course anytime starting from 2nd spring semester of the Bachelor studies.
Learning outcomes:
Upon completion of the course, the student
- knows basic skills required in working life,
- recognizes his/her own skills,
- is able to present those in the CV.

Contents:
Practical training in the field.
Mode of delivery:
Practical training in the field.
Learning activities and teaching methods:
The student finds the place for practical training by him/herself and agrees on the training with the teacher responsible. 1 ECTS credit equals approximately to two weeks of training. Practical training includes writing a plan before the training and after the training - updating the CV and evaluation of the learned skills. The student submits these documents for acceptance by person responsible.
The course can be compensated based on earlier working experince using RPL-protocol (recognition of prior learning).

Target group:
Bachelor degree students of Medical and Wellness Technology
Prerequisites and co-requisites:
Student needs to have adequate basic skills for the training tasks required by the training place.
Recommended optional programme components:
The course is an indpendent entity, but the student is expected to have adequate basic skills for learning in the training.
Assessment methods and criteria:
Before the training period the eligibility of the position is evaluated by the person responsible. Before the training the student makes a plan for the trainig and the objectives. After the training period student evaluates skills learned in relation to working skills and studies. Student provides letter of reference and other documentation (CV and application form) for the person responsible. If the student wishes to have the course compensated based on earlier working experince, he/she fills RPL-form, updates CV and delivers them for evaluation by person responsible.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
Dr Maarit Kangas
Working life cooperation:
Practical training can take place in companies, universities or other research organisations.

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
Language of instruction:
Finnish
Timing:
Spring semester, periods 4-6
Learning outcomes:
After completing the course the student knows the key concepts of probability and the most important random variables and is able to use them in calculating probabilities and parameters of probability distributions. In addition, the student is able to analyze statistical data by calculating interval and point estimates for the parameters. The student is also able to formulate statistical hypotheses and test them.
Contents:
The key concepts of probability, random variable, parameters of probability distributions, estimation of parameters, hypothesis testing.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 44 h/Exercises 22 h/Self-study 68 h.
Target group:
-
Prerequisites and co-requisites:
The recommended prerequisites are the course 031010P Calculus I and some parts of the course 031011P Calculus II.
Recommended optional programme components:
-
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:
Numerical grading scale 1-5.
Person responsible:
Jukka Kemppainen
Working life cooperation:
-
Other information:
-

465075A: Research Techniques for Materials, 3,5 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

465105A Research techniques for materials 5.0 op

Ei opintojaksokuvauksia.

763333A: Solid state physics, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

763343A	Solid state physics	5.0 op
766330A-01	Structure of matter, part 1: Solid state physics	0.0 op
766330A-02	Structure of matter, part 2: Nuclear and particle physics	0.0 op
766330A	Structure of matter	6.0 op

ECTS Credits:
4 credits
Language of instruction:
Finnish
Timing:
2nd spring
Learning outcomes:
To learn to explain the basics of solid state physics such as lattice structure, binding interactions, lattice vibrations, band structure and its effect on conductivity, conductivity of semiconductors, the interaction between light and matter, magnetism and superconductivity, and to apply these to different materials.
Contents:
The content of the course is equivalent to the content of part 1 of the course 766330A Structure of Matter.
Person responsible:
Erkki Thuneberg and Matti Alatalo

766328A: Thermophysics, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761314A	Thermophysics	5.0 op
766348A	Thermophysics	7.0 op
761102P	Basic Thermodynamics	2.0 op

ECTS Credits:
6 credits
Language of instruction:
Finnish
Timing:
Third autumn semester
Learning outcomes:
The student can explain the basic principles of thermophysics and can derive their consequences in the extent and level of the lectures (see Contents). In addition, he/she can solve problems which require profound understanding of the essential contents of the course.
Contents:
The goal of the course is to explain how the macroscopic thermophysical properties of a system (e.g., equation of state) can be derived from its fundamental microscopic properties (e.g., from the behavior of the molecules). For this purpose, the students are given a physically clear understanding of the basic principles of thermophysics, recognizing the fundamental role of its statistical nature. Topics will include: Basic concepts, The first law, Thermal expansion, heat transfer, and diffusion, The second law, The combined law, Heat engines and refrigerators, Thermodynamic potentials, Phases of matter, Classical ideal gas, Classical and open systems, Quantal ideal gas.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 46 h, 12 exercises (24 h), self-study 90 h

Target group:
Primarily for the students of the degree programme in physics. 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:
Textbooks: H. D. Young and R. A. Freedman: University Physics, 13th edition, Pearson Addison-Wesley, 2012, or earlier editions (in part), F. Mandl: Statistical Physics, second edition, John Wiley & Sons Ltd., 1988 (in part).
Lecture notes: Juhani Lounila: 766328A Termofysiikka, Oulun yliopisto, 2014.
Course material availability can be checked here.
Assessment methods and criteria:
Two written intermediate examinations or one final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0-5, where 0 = fail
Person responsible:
Juhani Lounila
Working life cooperation:
No work placement period
Other information:
Due to the partial overlap of the subject matters of the courses 761102P Basic Thermodynamics (2 cp) and 766328A Thermophysics (6 cp), exceptionally only 5 cp (not 6 cp) are given for the latter course in the special case that the student has previously completed the course Basic Thermodynamics and has got 2 cp for that.
https://wiki.oulu.fi/display/766328A/

764664S: Analysis and simulation of biosystems, 6 op

Voimassaolo: 01.01.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

764364A	Analysis and simulation of biosystems	6.0 op

ECTS Credits:
6 credits
Language of instruction:
Finnish (or English)
Timing:
3th or 4th autumn (organized only during even-numbered years or even more rarely)
Learning outcomes:
The student is able to use modelling in the analysis of simple biosystems, with the utilization of the concept of analogies between different types of systems. Further, with those skills the student will be able to build simulations of relatively simple biosystems and analyze their properties.
Contents:
See 764364A Analysis and simulation of biosystems
Person responsible:
Iikka Salmela, Kyösti Heimonen

080914S: Biomedical Engineering and Medical Physics Seminar, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
3 ECTS credit points / 81 hours of work
Language of instruction:
English or Finnish
Timing:
Master studies, 1st period
Learning outcomes:
The student can identify the essential features of scientific publications. The student can present the central content of a scientific article to others. The student can present critical questions related to a scientific presentation, and give and receive feedback on the presentations.
Contents:
Seminars and scientific literature. Publication forums in the field and characteristics of scientific articles.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Introduction lectures, presentations and discussion of the latest scientific publications on the basis. Each student will give two presentations and opponed two (peer-assessment).
Lectures and seminars 20 h / Self-study 61 h.
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineering, biophysics, other degree programs)
Recommended optional programme components:
Selected scientific articles and material indicated by lecturer

Recommended or required reading:
Selected scientific articles and material indicated by lecturer

Assessment methods and criteria:
Attending seminars, making presentations and acting as an opponent. The assessment criteria are based on the learning outcomes of the course. The more detailed assessment criteria is found on Optima.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Timo Jämsä
Other information:
Also for doctoral studies

521093S: Biomedical Instrumentation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Igor Meglinski

Opintokohteen kielet: Finnish

Leikkaavuudet:

521107S	Biomedical Instrumentation	6.0 op

ECTS Credits:
5
Language of instruction:
English.
Timing:
Period 3.
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:
Igor Meglinski
Working life cooperation:
No.

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
Language of instruction:
English. Examination can be taken in English or Finnish.
Timing:
The course unit is held in the autumn semester, during period II. It is recommended to complete the course at the end of studies.
Learning outcomes:
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.
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. The course ends with a written exam. Read more about assessment criteria at the University of Oulu webpage.
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.

580101Y: Introduction to University Studies, 2 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credit points / 54 hours of work
Language of instruction:
Finnish or English
Timing:
1st year, 1st period
Learning outcomes:
After the course the student
1. identifies the most important departments, organizations and associations related to studying and knows their function and services
2. identifies the essential features for university studies and study planning in the field of medical and wellness technology
3. identifies ones path of studies

Contents:
University studies. University and the learning environment, aims of the studies, structure and content, working methods, services provided for students. How to plan studies and making a personal study plan (PSP). Study groups.
Mode of delivery:
Face-to-face-teaching
Learning activities and teaching methods:
Tutor and tutor teacher meetings, drawing the personal study plan, and discussion with the PSP advisor, total 54 hours.
Target group:
1st year students of Medical and Wellness Technology and students of Master of Health Science programme, 1st period

Assessment methods and criteria:
Taking part into group meetings, making a personal study plan. Personal study plan discussion about with the study advisor.
Grading:
The course utilizes verbal grading: pass or fail
Person responsible:
Tutors, study advisor
Working life cooperation:
No

580213S: Master's Thesis in Biomedical Engineering, 30 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: English

ECTS Credits:
30 ECTS credit points / 810 hours of work
Language of instruction:
English
Timing:
Master studies
Learning outcomes:
The student can independently solve a research problem, and describe and solve it. The student can report the work in written form according to the scientific report principles.
Contents:
Research project in the field of medical & wellness technology. Presentation of the study plan and writing of the thesis.
Mode of delivery:
Independent work
Learning activities and teaching methods:
Thesis can be made at different research groups of the university or in industry or health care system. The student writes the thesis independently supported by the supervisor. The topic and contents should be discussed with the professor beforehand.
Target group:
Master Students of Biomedical Engineering/Biomechanics and Imaging.
Assessment methods and criteria:
Presentation of the study plan and writing the thesis
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Timo Jämsä
Other information:
It is recommended that before starting the Master’s Thesis student has completed about 60 credits from master studies.

580211S: Maturity Test, 0 op

Voimassaolo: 01.08.2003 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
0 ECTS credit points
Language of instruction:
Finnish or Swedish / English
Timing:
After completion of Master's Thesis

Learning outcomes:
The student can produce mature text in popular form of the research field and thus show ones familiarity to the field
Contents:
Depends on the topic of the thesis
Mode of delivery:
Literary work
Learning activities and teaching methods:
Takes place after bachelor's thesis. Written based on a given topic considering the thesis.
Target group:
Bachelor Students of Medical and Wellness Technology

Recommended optional programme components:
Will be written after the Bachelor's Thesis has been submitted for review.

Assessment methods and criteria:
Writing the Maturity test or the abstract of the Master's Thesis in the student's native language Finnish or Swedish. If the student's native language is another than Finnish or Swedish the Faculty will define separately the requirements for the language test.
Grading:
Pass or fail. The contents will be assessed by the person responsible. If the student has not made the maturity test as part of the bachelor degree, the language will be assessed by a teacher of the Languages and Communication, University of Oulu Extension School.

Person responsible:
Professor Timo Jämsä
Other information:
If the student has not made the maturity test as part of bachelor's degree, the maturity test also presents the language skills in Finnish or Swedish.

764634S: Medical physics and imaging, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Miika Nieminen

Opintokohteen kielet: Finnish

ECTS Credits:
6 credits
Language of instruction:
English
Timing:
4th-5th Autumn (organized only during odd-numbered years or even more rarely)
Learning outcomes:
The student is able to define the physical principles on which various medical diagnostic and therapeutic devices are based upon.
Contents:

The course acquaints the students to the basic physics related to imaging modalities and therapeutic systems used in hospitals. Covered topics include e.g. x-ray imaging, computed tomography, magnetic resonance imaging, nuclear medicine, radiation therapy and methods of clinical neurophysiology.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 32 h, calculus assignments 4 h, demonstrations 6 h, reporting 25 h, self-study 112 h
Target group:
Physics MSc students with biophysics major or/and medical physics minor, biomedical engineering students. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Recommended: physics basic courses and Radiation physics, biology and safety (766116P, 761116P, 764117P or 764317A).
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Dowsett, Kenny, Johnston: The Physics of Diagnostic Imaging, 2nd ed., Hodder Arnold, 2006.
Webster: Medical instrumentation: application and design, 4th ed, John Wiley & Sons, 2010.
Podgorsak: Radiation Oncology Physics – A handbook for teachers and students, IAEA, 2005 (http://www-pub.iaea.org/mtcd/publications/pdf/pub1196_web.pdf).

Additional literature depending on the lecturers.
Course material availability can be checked here.
Assessment methods and criteria:
One written examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Miika Nieminen, Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website
The course will be organized using other code.

580121A: Practical training, 1 - 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
1-5 ECTS credit points. Practical training can be accepted to elective studies. Maximum is 5 ECTS. One ECTS is equal to two week of training.
Language of instruction:
Finnish or english
Timing:
Master studies
Learning outcomes:
The student can undertake supervised tasks in working life, recognize their own skills and present those in the CV.
Contents:
Practical training in the field.
Mode of delivery:
Practical training in the field.
Learning activities and teaching methods:
Student find the place for practical training by self and arrange the training together with the contact person.

Target group:
Master Students of Medical and Wellness Technology.
Assessment methods and criteria:
Practical training related to the study area. The student will acquire an agreement with the practical training contact person on the suitability of the proposed training as part of studies. The student will return updated CV, practical training report and description of training to the department.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
Yes. The purpose of the training is to familiarize the student with the practical working life.
Other information:
Practical Training 2 can be included in the Master's Degree. For more information, please contact Dr Maarit Kangas.

521124S: Sensors and Measuring Techniques, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Igor Meglinski

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English.

Timing:
Period 1.
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:
Igor Meglinski
Working life cooperation:
No.

580214S: Study Plan of the Thesis, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credit points / 135 hours of work

Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The students is able to plan and organize a research project in the future.
Contents:
Writing study plan of the thesis
Mode of delivery:
Independed work
Learning activities and teaching methods:
The student writes study plan of the thesis independently supported by the supervisor. The topic and contents are discussed with the professor. Presentation of the study plan

Target group:
Master Students of Biomedical Engineering or Medical Technology
Recommended optional programme components:
To be done before Master's Thesis.

Assessment methods and criteria:
Writing study plan of the thesis and presenting it at a seminar.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Other information:
Before starting Study plan of the Thesis and Master's Thesis the student should have completed approximately 60 ECTS credits from master studies.

580401A: Basic Biomaterials, 2 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credit points / 54 hours of work.
Language of instruction:
Finnish or english

Timing:
Master studies, autumn 2016, 2nd period. The course is not organized every year.
Learning outcomes:
The student can list essential biological and tissue-replacing materials and can describe their properties. The student identifies and can explain the basics of interactions between biomaterials and tissues.
Contents:
Biocompatibility, metallic and ceramic implantation materials, polymers, biodegradable materials, bioglass, multifunctional biomaterials, tissue engineering, examples of applications.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 18 h / self-study 36 h. Essay.
Target group:
Master Students of Medical and Wellness technology and all other who are intressed in biomaterials.
Recommended or required reading:
Lecture material. Literature: Introduction to biomaterials: Basic Theory with Engineering Application. C. Mauli Agrawal. Joo L. Ong, Mark R. Appleford, and Gopinath Mani. Cambridge texts in Biomedical Engineering
Assessment methods and criteria:
Participating to class and essay.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
No
Other information:
This course is a part of specialization Biomedical Technology.

580402S: Biomedical Imaging Methods, 1 - 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Simo Saarakkala

Opintokohteen kielet: English

ECTS Credits:
1-5 ECTS credit points / 27-135 hours of work.
Language of instruction:
English
Timing:
Master studies, 4th period. The course is not organized every year.
Learning outcomes:
The student understands and can describe the basic principles and main applications of imaging methods used in biomedical research.
Contents:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Target group:
Master Students of Medical and Wellness technology and Biomedical Engineering and all other who are interested in methods of biomedical imaging

Recommended or required reading:
Required literature is given in the lectures.
Assessment methods and criteria:
Participation in the lectures and demonstrations, study diary. Exercises. Written exam. The course can be taken as 1, 2, 3 or 5 ECTS.

1 ECTS # participation in the lectures
2 ECTS # participation in the lectures and demonstrations
3 ECTS # participation in the lectures and demonstrations + practical assignment
5 ECTS # participation in the lectures and demonstrations + practical assignment and final exam
Grading:
The 1, 2 or 3 ECTS courses utilize verbal grading: pass or fail. The 5 ECTS course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Associate Professor Simo Saarakkala
Working life cooperation:
No

521240S: Biophotonics and Biomedical Optics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Igor Meglinski

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English
Timing:
Period 2
Learning outcomes:
On successful completion of the course, students will be able to categorize the basic principles of modern optical and laser-based diagnostic modalities and instruments used in advanced biomedical research and clinical medicine. They will be able to demonstrate detailed understanding and evaluate the key biophotonics techniques underlying day-to-day clinical diagnostic and therapies and industrial applications in pharmacy, health care and cosmetic products. They can operate with the selected techniques of their choice.
Contents:
The course includes in-depth coverage of state-of-the-art optical imaging and spectroscopy systems for advanced biomedical research and clinical diagnosis, fundamental properties of light such as coherence, polarization, angular momentum, details of light interaction with tissue, and modern imaging system. Coherent Optical Tomography (OCT), Laser Doppler Flowmetry, Laser Speckle Imaging (LSI), Photo-Acoustic Tomography (PAT), Tissue polarimetry; Optical and Near-Infra-Red Spectroscopy (NIRS), Confocal and Fluorescence Microscopies; Tissue Optics: Light /matter interactions, index of refraction, reflection, optical clearing, absorption, Mie scattering, Rayleigh scattering, Monte Carlo modelling.
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:
A new course
Recommended or required reading:

V.V Tuchin: Handbook of Optical Biomedical Diagnostics, SPIE Press, 2002; V.V Tuchin: Handbook of Coherent Domain Optical Methods, Springer, 2nd edition, 2013. D.A Boas, C. Pitris, N. Ramanujam, Handbook of Biomedical Optics, CRC Press, 2011.
Assessment methods and criteria:
The course is passed by the final exam and with the assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5
Person responsible:
Igor Meglinski
Working life cooperation:
No.

080917S: Project in Biomedical Technology, 5 - 10 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.
Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The student is abel to solve a research problem and report it in writing.
Contents:
Performing a small ressearch project.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
The student participates in a research project within or outside the university. The student prepares a personal project plan according to separate specifications. At the end of the project, the student prepares a written research report and presents it in a seminar.
Target group:
Master Students of Medical and Wellness Technology.
Assessment methods and criteria:
Preparing a project plan, project implementation, preparing a written report and presenting it in a seminar. Participates in two other seminar sessions.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
No
Other information:
This course is part of the specialization of Biomedical Technology.

465105A: Research techniques for materials, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail
Opettajat: Nousiainen, Olli Pekka
Opintokohteen kielet: Finnish
Leikkaavuudet:

465075A Research Techniques for Materials 3.5 op

Ei opintojaksokuvauksia.

761359A: Spectroscopic methods, 5 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766359A Spectroscopic methods 7.0 op

ECTS Credits:
5 credits
Language of instruction:
Finnish
Timing:
Every second year (odd year), spring term
Learning outcomes:
After completion, student knows the principles of various spectroscopic methods and what kind of physical /biophysical phenomena can be studied and what kind of information can be obtained with these methods.
Contents:
Basic principles of infrared, mass and NMR spectroscopy and X-ray analytics are introduced
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 46 h, exercises 24 h, self-study 63 h
Target group:
Compulsory for students in biophysics. Recommended for students directing at some of the lines in atomic, molecular and materials physics. 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:
Partly distributed through net, and partly as paper copies during the course.
Assessment methods and criteria:
Two written examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Ville-Veikko Telkki
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/761359A/

080915S: Tissue Biomechanics, 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

ECTS Credits:
5 ECTS credit points /135 hours of work.
Language of instruction:
English
Timing:
Master studies, 1st period
Learning outcomes:
The student can describe the main biomechanical characteristics of different tissues as well as their failure mechanisms. The student can perform practical biomechanical experiments, analyze measurement data, interpret results, and report them using good scientific reporting practice. The student understand how numerical modeling can be used to solve problems in tissue biomechanics.
Contents:
Introduction to tissue biomechanics. Most important biomechanical parameters and material models. Experimental measurements of biomechanical properties of tissues. Structure, composition and mechanical properties of different tissues. Biomechanical modeling of tissues.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 15h / Exercises 8h / Assignment 8h / Self-study 104h. Final exam.
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineers, biophysics, other degree programs) and all other who are interested
Prerequisites and co-requisites:
Basic knowledge on cell biology, anatomy and physiology, mechanics differential equations and matrix algebra.

Recommended or required reading:
Material given during lectures.
Assessment methods and criteria:
Accepted exercises, written 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:
Associate Professor Simo Saarakkala
Working life cooperation:
No
Other information:

040911S: Using animals in research - carrying out procedures, 3 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Laboratory Animal Centre

Arvostelu: 1 - 5, pass, fail

Opettajat: Voipio Hanna-marja

Opintokohteen kielet: Finnish

Leikkaavuudet:

040900S	Using animals in research - carrying out procedures	2.5 op

Ei opintojaksokuvauksia.

580402S: Biomedical Imaging Methods, 1 - 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Simo Saarakkala

Opintokohteen kielet: English

ECTS Credits:
1-5 ECTS credit points / 27-135 hours of work.
Language of instruction:
English
Timing:
Master studies, 4th period. The course is not organized every year.
Learning outcomes:
The student understands and can describe the basic principles and main applications of imaging methods used in biomedical research.
Contents:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Target group:
Master Students of Medical and Wellness technology and Biomedical Engineering and all other who are interested in methods of biomedical imaging
Recommended or required reading:
Required literature is given in the lectures.
Assessment methods and criteria:
Participation in the lectures and demonstrations, study diary. Exercises. Written exam. The course can be taken as 1, 2, 3 or 5 ECTS.

1 ECTS # participation in the lectures
2 ECTS # participation in the lectures and demonstrations
3 ECTS # participation in the lectures and demonstrations + practical assignment
5 ECTS # participation in the lectures and demonstrations + practical assignment and final exam
Grading:
The 1, 2 or 3 ECTS courses utilize verbal grading: pass or fail. The 5 ECTS course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Associate Professor Simo Saarakkala
Working life cooperation:
No

521282S: Biosignal Processing II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kortelainen

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5
Language of instruction:
Lectures and laboratory works are given in English. The examination can be taken in Finnish or English.
Timing:
Period 4
Learning outcomes:
1. knows the special characteristics of neural signals and the typical signal processing methods related to them

2. can solve advanced problems related to the neural signal analysis
Contents:
Introduction to neural signals, artifact removal, anesthesia and natural sleep, topographic analysis and source localization, epilepsy, evoked potentials.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures (8 h) and laboratory work (20 h), written exam.
Target group:
Engineering students, medical and wellness technology students, and other students interested in biomedical engineering. Students of the University of Oulu.
Prerequisites and co-requisites:
The basic engineering math courses, digital filtering, programming skills, Biosignal Processing I.
Recommended optional programme components:
-
Recommended or required reading:
The course is based on selected parts from books "EEG Signal Processing", S. Sanei and J. A. Chambers, "Bioelectrical Signal Processing in Cardiac and Neurological Applications", L. Sörnmo and P. Laguna, and "Neural Engineering", B. He (ed.) as well as lecture slides and task assignment specific material.
Assessment methods and criteria:
Laboratory work is supervised by the assistants who will also check that the task assignments are completed properly. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading of the accepted exam is in the range 1-5.
Person responsible:
Jukka Kortelainen
Working life cooperation:
-

521259S: Digital Video Processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

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
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:
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 10h, Laboratory work 20h, Self-study 20h, 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

521466S: Machine Vision, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Heikkilä, Janne Tapani

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English
Timing:
Spring, periods 3.
Learning outcomes:
1. can utilize common machine vision methods for various image analysis problems

2. can detect and recognize objects using features computed from images

3. can use motion information in image analysis

4. can use model matching in image registration and object recognition

5. can explain the basics of geometric computer vision

6. can calibrate cameras

7. can use stereo imaging for 3D reconstruction

8. can use Matlab for implementing basic machine vision algorithms
Contents:
Course provides an introduction to machine vision, and its applications to practical image analysis problems. Common computer vision methods and algorithms as well as principles of image formation are studied. Topics: 1. Introduction, 2. Imaging and image representation, 3. Color and shading, 4. Image features, 5. Recognition, 6. Texture, 7. Motion from 2D image sequences, 8. Matching in 2D, 9. Perceiving 3D from 2D images, 10. 3D reconstruction.
Mode of delivery:
Face-to-face teaching, homework assignments.
Learning activities and teaching methods:
Lectures (20 h), exercises (16 h) and Matlab homework assignments (16 h).
Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
521467A Digital Image Processing
Recommended optional programme components:
521289S Machine Learning. This courses provide complementary information on machine learning methods applied in machine vision. It is recommended to be studied simultaneously.
Recommended or required reading:
Lecture notes and exercise material. The following books are recommended for further information: 1) Shapiro, L.G., Stockman,G.C.: Computer Vision, Prentice Hall, 2001. 2) R. Szeliski: Computer Vision: Algorithms and Applications, Springer, 2011. 3) D.A. Forsyth & J. Ponce: Computer Vision: A Modern Approach, Prentice Hall, 2002.
Assessment methods and criteria:
The course is passed with final exam and accepted homework assignments.
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:
Janne Heikkilä
Working life cooperation:
No.

080918S: Project in Medical Imaging, 5 - 10 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.
Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The student is able to solve a research problem and perort it written.
Contents:
Performing a samlla research project.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
The student participates in a research project within or outside the university. The student prepares a personal project plan according to separate specifications. At the end of the project, the student prepares a written research report and presents it in a seminar. In addition, the student participates in at least two other seminar sessions.
Target group:
Master Students of Medical and Wellness Technology
Assessment methods and criteria:
Preparing a project plan, project implementation, preparing a written report and presenting it in a seminar. Participates in two other seminar sessions.

Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
No
Other information:
This course is a part of the specialization of Medical Imaging.

521149S: Special Course in Information Technology, 5 - 8 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ojala, Timo Kullervo

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5-8
Language of instruction:
English; Finnish when only Finnish-speaking students.
Timing:
Autumn and Spring, periods 1-4.
Learning outcomes:
The learning outcomes are defined based on the course topic.
Contents:
Varies yearly.
Mode of delivery:
Face-to-face teaching, also web-based teaching can be used.
Learning activities and teaching methods:

Lectures, exercises, design exercise, project work and seminars depending on the topic of the year. The implementation of the course will be informed separately. The course can be given several times with different contents during the academic year and it can be included into the degree several times.
Target group:
M.Sc. level students of Computer Science and Engineering; other students are accepted if there is space in the classes.
Prerequisites and co-requisites:
Will be defined based on the contents.
Recommended optional programme components:
No.
Recommended or required reading:
Will be announced at the first lecture
Assessment methods and criteria:
Depends on the working methods.
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:
CSE degree program professors.
Working life cooperation:
-

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

ECTS Credits:
5 ECTS credit points / 135 hours of work.
Language of instruction:
English
Timing:
Master studies, 3rd period
Learning outcomes:
The student can describe the main challenges of movement biomechanics and principles for motion analysis. The student knows 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 ofmovement. Balance measurement. Fall biomechanics. Measurement of physical activity.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 14 h / Assignment 54 h / Self-study 67 h. Final exam.
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineers, biophysics, other degree programs) and all other who are interested
Prerequisites and co-requisites:
It is recommended to have basic knowledge on anatomy and physiology, sensors and measurement techniques and signal processing.
Recommended or required reading:
Material given during lectures.
Assessment methods and criteria:
Accepted home exercises and assignments, written exam. The exam includes definition and explanation assignments and problems.

Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Timo Jämsä
Other information:
This course is a part of the specialization of Health Technology.

521282S: Biosignal Processing II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kortelainen

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5
Language of instruction:
Lectures and laboratory works are given in English. The examination can be taken in Finnish or English.
Timing:
Period 4
Learning outcomes:
1. knows the special characteristics of neural signals and the typical signal processing methods related to them

2. can solve advanced problems related to the neural signal analysis
Contents:
Introduction to neural signals, artifact removal, anesthesia and natural sleep, topographic analysis and source localization, epilepsy, evoked potentials.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures (8 h) and laboratory work (20 h), written exam.
Target group:
Engineering students, medical and wellness technology students, and other students interested in biomedical engineering. Students of the University of Oulu.
Prerequisites and co-requisites:
The basic engineering math courses, digital filtering, programming skills, Biosignal Processing I.
Recommended optional programme components:
-
Recommended or required reading:
The course is based on selected parts from books "EEG Signal Processing", S. Sanei and J. A. Chambers, "Bioelectrical Signal Processing in Cardiac and Neurological Applications", L. Sörnmo and P. Laguna, and "Neural Engineering", B. He (ed.) as well as lecture slides and task assignment specific material.
Assessment methods and criteria:
Laboratory work is supervised by the assistants who will also check that the task assignments are completed properly. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading of the accepted exam is in the range 1-5.
Person responsible:
Jukka Kortelainen
Working life cooperation:
-

521430A: Electronic Measurement Techniques, 6 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Saarela
Opintokohteen kielet: Finnish
Leikkaavuudet:

521092A	Electronic Measurement Techniques	5.0 op
521171A	Electronic Measurement Techniques	6.5 op
521171A-01	Electronic measurement techniques, exam	0.0 op
521171A-02	Electronic measurement techniques, exercise work	0.0 op

Ei opintojaksokuvauksia.

040404A: Health technology and rehabilitation, 5 op

Voimassaolo: 01.08.2008 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Open University, Oulu
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay040404A	Health technology and rehabilitation (OPEN UNI)	5.0 op

Ei opintojaksokuvauksia.

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
Opintokohteen kielet: English

ECTS Credits:
5
Language of instruction:
In English.
Timing:
Autumn, periods 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 (20 h), exercises (20 h), and practical work (95 h). The course is passed with an approved practical work. 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 4 individual exercises throughout the semester: 1: Using questionnaires; 2: Grouping & clustering; 3: Fitts' law; 4: Advanced evaluation & visualisations. Passing criteria: all 4 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:
Jorge Goncalves
Vassilis Kostakos
Working life cooperation:
-

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

Opettajat: Kess, Pekka Antero

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 understands the key concepts of operations and production management. The student should know the essential production strategies. The student should also understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analyzing and constructing development plans for production organizations. Upon completion of the course the student can apply the management methods also in service systems. The student also understands 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 95 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:
No.

Other information:
Substitutes course 555322S Production Management.

080919S: Project in Health Technology, 5 - 10 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.
Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The student is able to solve a research problem and report it in writing.
Contents:
Performing a small project.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
The student participates in a research project within or outside the university. The student prepares a personal project plan according to separate specifications. At the end of the project, the student prepares a written research report and presents it in a seminar. In addition, the student participates in at least two other seminar sessions.
Target group:
Master Students of Medical and Wellness Technology.
Assessment methods and criteria:

Preparing a project plan, project implamentaion, preparing a written report and presenting it in a seminar. Participates in two other seminar sessions.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timi Jämsä
Working life cooperation:
No
Other information:
This course is a part of the specialization of Health Technology.

521285S: Affective Computing, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Guoying Zhao

Opintokohteen kielet: English

ECTS Credits:
5
Language of instruction:
English
Timing:
Fall, periods 1
Learning outcomes:
1. is able to explain the emotion theory and modeling

2. is able to implement algorithms for emotion recognition from visual, audio or physiological signals or the fusion of multi-modalities

3. is able to use the basic tools to synthesize facial expressions and speech

4. has the ideas of wide applications of affective computing
Contents:
The history and evolution of affective computing; psychological study about emotion theory and modeling; emotion recognition from different modalities: facial expression, speech, bio-signals like heart rate, EEG; crowdsourcing study; synthesis of emotional behaviors; emotion applications.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
The course consists of lectures and exercises. The final grade is based on the points from exam while there are several mandatory exercises.
Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
A prior programming knowledge, possibly the bachelor level mathematical studies and/or some lower level intermediate studies (e.g. computer engineering or artificial intelligence courses). The recommended optional studies include the advanced level studies e.g. the pattern recognition and neural networks and/or computer vision courses.
Recommended optional programme components:
-
Recommended or required reading:
All necessary material will be provided by the instructor.
Assessment methods and criteria:
The assessment of the course is based on the exam (100%) with mandatory exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 1-5; zero stands for a fail.
Person responsible:

Guoying Zhao
Working life cooperation:
-

580202S: Biomedical Engineering Project, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
5-10 ECTS.
Language of instruction:
Finnish or English
Timing:
Master studies, elective course
Learning outcomes:
Learning outcomes: The student can solve a research problem and report this in written form.
Contents:
Working with a project
Learning activities and teaching methods:
Student takes part in a research or a developmental project carried out either in the University or outside. Student writes out a report and presents it orally. In addition, the student participates in other seminar sessions. The project can be linked to a summer job or practical training.

Target group:
Students of Medical and Wellness Technology

Assessment methods and criteria:
Written report and oral presentation. Participates in two other seminar sessions. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass or fail.
Person responsible:
Professor Timo Jämsä

521240S: Biophotonics and Biomedical Optics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Igor Meglinski

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English
Timing:
Period 2
Learning outcomes:
On successful completion of the course, students will be able to categorize the basic principles of modern optical and laser-based diagnostic modalities and instruments used in advanced biomedical research and clinical medicine. They will be able to demonstrate detailed understanding and evaluate the key biophotonics techniques underlying day-to-

day clinical diagnostic and therapies and industrial applications in pharmacy, health care and cosmetic products. They can operate with the selected techniques of their choice.
Contents:
The course includes in-depth coverage of state-of-the-art optical imaging and spectroscopy systems for advanced biomedical research and clinical diagnosis, fundamental properties of light such as coherence, polarization, angular momentum, details of light interaction with tissue, and modern imaging system. Coherent Optical Tomography (OCT), Laser Doppler Flowmetry, Laser Speckle Imaging (LSI), Photo-Acoustic Tomography (PAT), Tissue polarimetry; Optical and Near-Infra-Red Spectroscopy (NIRS), Confocal and Fluorescence Microscopies; Tissue Optics: Light /matter interactions, index of refraction, reflection, optical clearing, absorption, Mie scattering, Rayleigh scattering, Monte Carlo modelling.
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:
A new course
Recommended or required reading:
V.V Tuchin: Handbook of Optical Biomedical Diagnostics, SPIE Press, 2002; V.V Tuchin: Handbook of Coherent Domain Optical Methods, Springer, 2nd edition, 2013. D.A Boas, C. Pitris, N. Ramanujam, Handbook of Biomedical Optics, CRC Press, 2011.
Assessment methods and criteria:
The course is passed by the final exam and with the assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5
Person responsible:
Igor Meglinski
Working life cooperation:
No.

521282S: Biosignal Processing II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kortelainen

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5
Language of instruction:
Lectures and laboratory works are given in English. The examination can be taken in Finnish or English.
Timing:
Period 4
Learning outcomes:
1. knows the special characteristics of neural signals and the typical signal processing methods related to them

2. can solve advanced problems related to the neural signal analysis
Contents:
Introduction to neural signals, artifact removal, anesthesia and natural sleep, topographic analysis and source localization, epilepsy, evoked potentials.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:

Lectures (8 h) and laboratory work (20 h), written exam.
Target group:
Engineering students, medical and wellness technology students, and other students interested in biomedical engineering. Students of the University of Oulu.
Prerequisites and co-requisites:
The basic engineering math courses, digital filtering, programming skills, Biosignal Processing I.
Recommended optional programme components:
-
Recommended or required reading:
The course is based on selected parts from books "EEG Signal Processing", S. Sanei and J. A. Chambers, "Bioelectrical Signal Processing in Cardiac and Neurological Applications", L. Sörnmo and P. Laguna, and "Neural Engineering", B. He (ed.) as well as lecture slides and task assignment specific material.
Assessment methods and criteria:
Laboratory work is supervised by the assistants who will also check that the task assignments are completed properly. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading of the accepted exam is in the range 1-5.
Person responsible:
Jukka Kortelainen
Working life cooperation:
-

764322A: Cell membrane biophysics, 10 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

764622S	Cell membrane biophysics	10.0 op

ECTS Credits:
10 credits
Language of instruction:
English
Timing:
3rd or 4th autumn (not necessarily organized every year)
Learning outcomes:
After finishing the course the student is able to describe the basics of cell membrane structure and function, to present the basic biophysical models describing the electrical function of the cell membrane, and to solve problems and calculations concerning these models. In addition, the student will be able make and present a short review and a talk about given scientific literature of this field.
Contents:
During the course the students will become acquainted with the central biophysical phenomena of the cell membrane, for example: the physical structure and properties of the cell membrane, lipids and proteins in the membrane, permeation and selectivity, ion channels and their kinetics. In addition they will get to know the basics about the theory of the intracellular or cell membrane recordings, the models describing the electrical function of the cell membrane and the analysis of these signals.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30 h, calculation exercises 22 h, seminars 4-8 h, seminar presentation, weekly assignments, self-study 210 h
Target group:
Biophysics students: recommended in minor (LuK), compulsory in major (FM). Also for the other students of the University of Oulu.
Prerequisites and co-requisites:

Introduction to biophysics (764103P) and Foundations of cellular biophysics (764115P) are recommended to be done before this course.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lecture handouts; J. Keener, J. Sneyd: Mathematical Physiology, Springer, Berlin, 1998 (partly).; D. Johnston, S. Wu: Foundations of Cellular Neurophysiology, MIT Press, Cambridge MA, 1995 (partly).
Course material availability can be checked here.
Assessment methods and criteria:
Home exam, final exam
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

764629S: Identification of linear systems, 5 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction:
English
Timing:
4th-5th spring (organized only during even-numbered years or even more rarely)
Learning outcomes:
The students can use modern methods to identify linear biological systems.
Contents:
The course introduces the concept of system identification. Starting from Fourier analysis, computation of frequency response functions and coherence functions will be taught. With examples and using real data the meaning, interpretation and use of these functions are also treated. The course ends with independent analysing project.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 10 h, project work 30 h, self-study 105 h
Target group:
Compulsory for M.Sc. students in biophysics
Prerequisites and co-requisites:
Biosystem analysis (764364A), Differential equations, Basic programming skills with MatLab.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lectures and lecture notes, System identification booklet (in English). Marmarelis V.Z.: Nonlinear dynamic modeling of physiological systems, IEEE Press, 2004. J. Bendat, Nonlinear system techniques and applications, Wiley, New York, 1998. (only parts of these books).
Course material availability can be checked here.
Assessment methods and criteria:
Grading is based on project report
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail

Person responsible:
Iikka Salmela, Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
Course website

747604S: Introduction to biocomputing, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: André Juffer

Opintokohteen kielet: English

ECTS Credits:
3 credits
Language of instruction:
English
Timing:
M.Sc. yr1-yr2 autumn
Learning outcomes:
Upon successful completion students are able to:

- discuss several biocomputing techniques
- decide which method to use under what circumstances
- judge the quality of an analysis of a given problem by means of biocomputing techniques

Contents:
An overview is given of commonly employed techniques of biocomputing to study the structural, dynamical, functional and thermodynamical properties of proteins and membranes and their interaction with other molecules. This will include a overview of computer simulation techniques such as molecular dynamics, Monte Carlo and Langevin (stochastic, Brownian) dynamics, but also concepts of continuum electrostatics, statistical thermodynamics, protein modeling techniques, protein-ligand affinity calculations and the computer simulation of the protein folding process and enzyme action. In addition, some topics in the field of Bioinformatics are discussed as well and certain commonly employed protein modeling software is introduced.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
20 h lectures, student tasks
Target group:
M.Sc. in Protein science and biotechnology
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Recommended books:
Leach, A.R., *Molecular modelling. Principles and applications*, Second edition, Prentice Hall, New York, 2001
Berendsen, H.J.C *Simulating the physical world. Hierarchial modeling from quantum mechanics to fluid dynamics.*, Cambridge University Press, Cambridge, 2007
Assessment methods and criteria:
Presentation, group discussion
Read more about assessment criteria at the University of Oulu webpage.
Grading:
pass/fail
Person responsible:
André Juffer
Working life cooperation:
No
Other information:
Location of instruction: Kontinkangas campus

521149S: Special Course in Information Technology, 5 - 8 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Ojala, Timo Kullervo

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5-8
Language of instruction:
English; Finnish when only Finnish-speaking students.
Timing:
Autumn and Spring, periods 1-4.
Learning outcomes:
The learning outcomes are defined based on the course topic.
Contents:
Varies yearly.
Mode of delivery:
Face-to-face teaching, also web-based teaching can be used.
Learning activities and teaching methods:
Lectures, exercises, design exercise, project work and seminars depending on the topic of the year. The implementation of the course will be informed separately. The course can be given several times with different contents during the academic year and it can be included into the degree several times.
Target group:
M.Sc. level students of Computer Science and Engineering; other students are accepted if there is space in the classes.
Prerequisites and co-requisites:
Will be defined based on the contents.
Recommended optional programme components:
No.
Recommended or required reading:
Will be announced at the first lecture
Assessment methods and criteria:
Depends on the working methods.
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:
CSE degree program professors.
Working life cooperation:
-

521285S: Affective Computing, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Guoying Zhao

Opintokohteen kielet: English

ECTS Credits:
5

Language of instruction:
English
Timing:
Fall, periods 1
Learning outcomes:
1. is able to explain the emotion theory and modeling

2. is able to implement algorithms for emotion recognition from visual, audio or physiological signals or the fusion of multi-modalities

3. is able to use the basic tools to synthesize facial expressions and speech

4. has the ideas of wide applications of affective computing
Contents:
The history and evolution of affective computing; psychological study about emotion theory and modeling; emotion recognition from different modalities: facial expression, speech, bio-signals like heart rate, EEG; crowdsourcing study; synthesis of emotional behaviors; emotion applications.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
The course consists of lectures and exercises. The final grade is based on the points from exam while there are several mandatory exercises.
Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
A prior programming knowledge, possibly the bachelor level mathematical studies and/or some lower level intermediate studies (e.g. computer engineering or artificial intelligence courses). The recommended optional studies include the advanced level studies e.g. the pattern recognition and neural networks and/or computer vision courses.
Recommended optional programme components:
-
Recommended or required reading:
All necessary material will be provided by the instructor.
Assessment methods and criteria:
The assessment of the course is based on the exam (100%) with mandatory exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 1-5; zero stands for a fail.
Person responsible:
Guoying Zhao
Working life cooperation:
-

580201A: Biomedical Engineering Programming Study, 5 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credit points / 135 hours of work.
Language of instruction:
Finnish or English
Timing:
Bachelor of Master studies, elective course.
Learning outcomes:
The student can design a solution to a programmig problem related to medical technology, can solve the task and report this in written form.

Contents:
Independent computer programming using modern programming tools, a written report.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
Students carry out an assigned programming project individually or in pairs and write out a report.
Self-study or group work 135hours.
Target group:
Student of Medical and Wellness Technology.
Prerequisites and co-requisites:
521141P Basic of Programming, 764627A/S Virtual Measurement Environments or similar knowledge.
Assessment methods and criteria:
The program and the report are assessed by the supervisor.

Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
No
Other information:
More information on the available topics can be inquired on the teachers of the department.

580202S: Biomedical Engineering Project, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
5-10 ECTS.
Language of instruction:
Finnish or English
Timing:
Master studies, elective course
Learning outcomes:
Learning outcomes: The student can solve a research problem and report this in written form.
Contents:
Working with a project
Learning activities and teaching methods:
Student takes part in a research or a developmental project carried out either in the University or outside. Student writes out a report and presents it orally. In addition, the student participates in other seminar sessions. The project can be linked to a summer job or practical training.

Target group:
Students of Medical and Wellness Technology

Assessment methods and criteria:
Written report and oral presentation. Participates in two other seminar sessions. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass or fail.
Person responsible:
Professor Timo Jämsä

521240S: Biophotonics and Biomedical Optics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Igor Meglinski

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English
Timing:
Period 2
Learning outcomes:
On successful completion of the course, students will be able to categorize the basic principles of modern optical and laser-based diagnostic modalities and instruments used in advanced biomedical research and clinical medicine. They will be able to demonstrate detailed understanding and evaluate the key biophotonics techniques underlying day-to-day clinical diagnostic and therapies and industrial applications in pharmacy, health care and cosmetic products. They can operate with the selected techniques of their choice.
Contents:
The course includes in-depth coverage of state-of-the-art optical imaging and spectroscopy systems for advanced biomedical research and clinical diagnosis, fundamental properties of light such as coherence, polarization, angular momentum, details of light interaction with tissue, and modern imaging system. Coherent Optical Tomography (OCT), Laser Doppler Flowmetry, Laser Speckle Imaging (LSI), Photo-Acoustic Tomography (PAT), Tissue polarimetry; Optical and Near-Infra-Red Spectroscopy (NIRS), Confocal and Fluorescence Microscopies; Tissue Optics: Light /matter interactions, index of refraction, reflection, optical clearing, absorption, Mie scattering, Rayleigh scattering, Monte Carlo modelling.
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:
A new course
Recommended or required reading:
V.V Tuchin: Handbook of Optical Biomedical Diagnostics, SPIE Press, 2002; V.V Tuchin: Handbook of Coherent Domain Optical Methods, Springer, 2nd edition, 2013. D.A Boas, C. Pitris, N. Ramanujam, Handbook of Biomedical Optics, CRC Press, 2011.
Assessment methods and criteria:
The course is passed by the final exam and with the assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5
Person responsible:
Igor Meglinski
Working life cooperation:
No.

521412A: Digital Techniques 1, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Mäntyniemi

Opintokohteen kielet: Finnish

Leikkaavuudet:

521301A Digital Techniques 1 8.0 op

Ei opintojaksokuvauksia.

521432A: Electronics Design I, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Häkkinen

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Finnish.
Timing:
Autumn, period 1
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

8. should be able to recount the basic principles governing the functions and properties of emitter-coupled logic
Contents:
Frequency response of a transistor amplifier, differential amplifier, feedback, stability and nonidealities of a feedback amplifier, comparator, output stages and power amplifiers, applications of operational amplifier, oscillators, tuned amplifiers and ECL logic.
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, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 10-13-8 and 14, partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 7,8,9,13 and partially 11 and 12.
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 Häkkinen
Working life cooperation:
-

031044A: Mathematical Methods, 4 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Applied Mathematics and Computational Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Kemppainen
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

766661S: NMR Imaging, 8 op

Voimassaolo: 01.01.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
8 credits
Language of instruction:
English
Timing:
Every second year (odd year), autumn
Learning outcomes:
After completion, student understands the principles of the imaging methods based on nuclear magnetic resonance (NMR) and how NMR imaging can be used to characterize physical properties of various materials.
Contents:
Topics include one-dimensional Fourier imaging, *k* space, gradient echoes, multidimensional Fourier imaging, continuous and discrete Fourier transform, sampling, folding, filtering, resolution, and contrast.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 44 h, exercises 20 h, self-study 149 h
Target group:
Primarily for the students of the degree programmes in physics and chemistry. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
761663S NMR spectroscopy is helpful, but not necessary.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Textbooks: E. M. Haake, R. W. Brown, M. R. Thompson and R. Venkatesan, Magnetic Resonance Imaging. Physical Principles and Sequence Design., John Wiley & Sons, Inc., 1999 (in part), B. Blümich, NMR Imaging of Materials, Clarendon Press, 2000 (in part).
Course material availability can be checked here.
Assessment methods and criteria:
One written examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Juhani Lounila and Ville-Veikko Telkki
Working life cooperation:
No work placement period
Other information:
Course website

580121A: Practical training, 1 - 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
1-5 ECTS credit points. Practical training can be accepted to elective studies. Maximum is 5 ECTS. One ECTS is equal to two week of training.
Language of instruction:
Finnish or english
Timing:
Master studies
Learning outcomes:
The student can undertake supervised tasks in working life, recognize their own skills and present those in the CV.
Contents:
Practical training in the field.
Mode of delivery:
Practical training in the field.
Learning activities and teaching methods:
Student find the place for practical training by self and arrange the training together with the contact person.
Target group:
Master Students of Medical and Wellness Technology.
Assessment methods and criteria:
Practical training related to the study area. The student will acquire an agreement with the practical training contact person on the suitability of the proposed training as part of studies. The student will return updated CV, practical training report and description of training to the department.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
Yes. The purpose of the training is to familiarize the student with the practical working life.
Other information:
Practical Training 2 can be included in the Master's Degree. For more information, please contact Dr Maarit Kangas.

521285S: Affective Computing, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Guoying Zhao

Opintokohteen kielet: English

ECTS Credits:
5
Language of instruction:
English
Timing:
Fall, periods 1
Learning outcomes:
1. is able to explain the emotion theory and modeling

2. is able to implement algorithms for emotion recognition from visual, audio or physiological signals or the fusion of multi-modalities

3. is able to use the basic tools to synthesize facial expressions and speech

4. has the ideas of wide applications of affective computing
Contents:
The history and evolution of affective computing; psychological study about emotion theory and modeling; emotion recognition from different modalities: facial expression, speech, bio-signals like heart rate, EEG; crowdsourcing study; synthesis of emotional behaviors; emotion applications.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
The course consists of lectures and exercises. The final grade is based on the points from exam while there are several mandatory exercises.
Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
A prior programming knowledge, possibly the bachelor level mathematical studies and/or some lower level intermediate studies (e.g. computer engineering or artificial intelligence courses). The recommended optional studies include the advanced level studies e.g. the pattern recognition and neural networks and/or computer vision courses.
Recommended optional programme components:
-
Recommended or required reading:
All necessary material will be provided by the instructor.
Assessment methods and criteria:
The assessment of the course is based on the exam (100%) with mandatory exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 1-5; zero stands for a fail.
Person responsible:
Guoying Zhao
Working life cooperation:
-

580201A: Biomedical Engineering Programming Study, 5 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credit points / 135 hours of work.
Language of instruction:
Finnish or English
Timing:
Bachelor of Master studies, elective course.
Learning outcomes:

The student can design a solution to a programmig problem related to medical technology, can solve the task and report this in written form.
Contents:
Independent computer programming using modern programming tools, a written report.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
Students carry out an assigned programming project individually or in pairs and write out a report.
Self-study or group work 135hours.
Target group:
Student of Medical and Wellness Technology.
Prerequisites and co-requisites:
521141P Basic of Programming, 764627A/S Virtual Measurement Environments or similar knowledge.
Assessment methods and criteria:
The program and the report are assessed by the supervisor.

Grading:
The course utilizes grading: pass or fail.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
No
Other information:
More information on the available topics can be inquired on the teachers of the department.

521412A: Digital Techniques 1, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Mäntyniemi

Opintokohteen kielet: Finnish

Leikkaavuudet:

521301A	Digital Techniques 1	8.0 op

Ei opintojaksokuvauksia.

521432A: Electronics Design I, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Häkkinen

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Finnish.
Timing:
Autumn, period 1
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

8. should be able to recount the basic principles governing the functions and properties of emitter-coupled logic
Contents:
Frequency response of a transistor amplifier, differential amplifier, feedback, stability and nonidealities of a feedback amplifier, comparator, output stages and power amplifiers, applications of operational amplifier, oscillators, tuned amplifiers and ECL logic.
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, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 10-13-8 and 14, partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 7,8,9,13 and partially 11 and 12.
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 Häkkinen
Working life cooperation:
-

031044A: Mathematical Methods, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kemppainen

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521238S: Optoelectronic Measurements, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Mäkynen
Opintokohteen kielet: Finnish
Leikkaavuudet:

521094S Optoelectronic Sensors of Future 5.0 op

Ei opintojaksokuvauksia.

464085A: Patenting, 3,5 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Niskanen, Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

464104A Product innovations 5.0 op
ay464085A Patenting (OPEN UNI) 3.5 op

Ei opintojaksokuvauksia.

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

ECTS Credits:
5 ECTS credits**.**

Language of instruction:
English.

Timing:
Period 1.

Learning outcomes:
This course introduces product development and innovations management in a company environment. The course provides fundamental understanding over tools and frameworks that can be used for analysing and managing products, innovations, and technology development. The aim is to create a connection between product development and other company functions. Upon completion of the course a student is capable of explaining the role of product development as a company function. The student understands the difference between innovation activities and systematic product development, and knows the difference between different phases of product development process and its activities. Student learns how to transform customer needs into requirements for product development process and finally into product features. Additionally, the student is able to define the meaning of other company functions to product development activities.

Contents:
Meaning of products for the operations of an industrial enterprise, product development paradigm and defining relevant concepts, realising product development methodologically (U&E model, Cooper's stage-gate model, QFD), managing innovations, and product development success factors.

Mode of delivery:
The tuition will be implemented as blended teaching.

Learning activities and teaching methods:
Lectures 20 h / exercises 6 h / group work and self-study 108 h.

Target group:
Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:
555226A Operations and production.

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, 555264P Managing well-being and quality of working life, and 555286A Process and quality management..

Recommended or required reading:
Handouts, course work, and a collection of articles. Ulrich, K. & Eppinger, S. (2008) Product Design and Development. McGraw-Hill. 358 p.

Assessment methods and criteria:
Assignment and final 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:
No.

Other information:
Substitutes course 555240A Basic Course in Product Development.

812671S: Usability Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Rajanen

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits / 133 hours of work.

Language of instruction:
English and Finnish
Timing:
The course is held in the spring semester, during periods 3 and 4.

Learning outcomes:

After completing the course, the student can:

- Design and follow through a usability testing process;
- Design usability test scenarios and tasks;
- Select test subjects;
- Plan and follow through usability tests as laboratory tests or field tests;
- Analyse and report the findings from usability tests.

Contents:
Basic terms and types of usability testing, usability tests process, usability test tasks and scenarios, test subjects, following through a usability test, analysing usability test material, reporting the findings from usability tests.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 24h, assignment tutoring 13h, assignment 90h, seminar 7h.
Target group:
MSc students

Prerequisites and co-requisites:
Student is familiar with most common user interface design terms, design and evaluation methods as in “Introduction to Human-Computer Interactions” course.
Recommended optional programme components:

Recommended or required reading:
Dumas, J. S. & Redish, J. C. (1993): A Practical Guide to Usability Testing. Ablex Publishing Corporation. Rubin, J. (1994): Handbook of
Usability Testing: How to Plan, Design, and Conduct Effective Tests. Chichester: John Wiley & Sons, Inc.
Assessment methods and criteria:
Assessment of the course is based on the learning outcomes of the course based on the written usability test plan, supervised usability tests, written usability test report and oral seminar presentation

Grading:
Numerical scale 1-5 or fail.
Person responsible:
Mikko Rajanen
Working life cooperation:
No
Other information: