Opasraportti

Courses in English for Exchange Students in Information Processing Science (2015 - 2016)

Courses in English for exchange students

This Weboodi Course Catalogue lists courses taught in English for exchange students at the Department of Information Processing Science during the academic year 2015-2016.

When planning your exchange studies and the required learning agreement please use the information provided under the **Courses** tab in this Study Guide. Please read carefully the information of each course you wish to take (language of instruction, target group, course content, timing, preceding studies, additional information etc.).

All exchange students must submit their exchange application through SoleMOVE.

Accepted exchange students are required to register to all courses. Course registration takes place once you have arrived in Oulu and received your University of Oulu login information. More information on registration will be provided during orientation. When registering you will be able to find detailed information on teaching and schedule under **Instruction** tab.

Individual course codes include information on the level of course.
xxxxxP, xxxxxY = basic, introductory level courses
xxxxxA = for 2-3 year students, Bachelor level courses
xxxxxS = for 4-5 year students, Master level courses

All Master level courses are in English. However, the courses may have restrictions. In addition, this guide has some Bachelor level courses as they are well supported in English. Read course descriptions!

Any general questions about courses in English at the Department should be addressed to:

Juha Iisakka
international.itee {at} oulu.fi.

Further information on application process for incoming exchange students:
http://www.oulu.fi/english/studentexchange
international.office(at)oulu.fi

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja - jaksot

811380A: Basics of Databases, 7 op
813316A: Business Process Modeling, 5 op
815303A: Embedded Software Development Environments, 5 op
813626S: Emerging Technologies and Issues, 5 op
811600S: Emerging Trends in Software Engineering, 5 op
811601S: Emerging Trends in Software Testing, 5 op
812351A: Enterprise Systems, 5 op
   Compulsory
      812351A-01: Enterprise Systems, exercise work, 0 op
      812351A-02: Enterprise Systems, exam, 0 op
817604S: ICT and Organizational Change, 5 op
813623S: Information Security Policy and Management in Organisations, 5 op
813625S: Information Systems Theory, 5 op
812331A: Interaction Design, 5 op
812346A: Object Oriented Analysis and Design, 6 op
815657S: Open Source Software Development, 5 op
817609S: Project Seminar, 3 op
815305A: Real Time Distributed Software Development, 5 op
813621S: Research Methods, 5 op
813620S: Software Business Management, 5 op
815662S: Software Engineering Management, Measurement and Improvement, 5 op
815663S: Software Engineering Research, 5 op
815312A: Software Production and Maintenance, 5 op
815311A: Software Quality and Testing, 5 op
817603S: System Design Methods for Information Systems, 5 op
811375A: User Interface Programming, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

811380A: Basics of Databases, 7 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Iisakka, Juha Veikko
Opintokohteen kielet: Finnish
Leikkaavuudet:

  811318A   Introduction to Data Management   9.0 op

  811318A-02   Introduction to data management, exam   0.0 op

  811318A-01   Introduction to data management, exercise work   0.0 op

Ei opintojaksokuvauksia.

813316A: Business Process Modeling, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kontula

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
English

Timing:
The course unit is held in the spring semester, during period 4. It is recommended to complete the course in the second year of Bachelor studies.

Learning outcomes:
After completing the course, students are able to model and develop business processes, as well as use a computer-based process modeling tool. The students are able to distinguish between business process change on the enterprise level, business process level and the implementation level, and to and evaluate these business process changes.

Contents:
Process architecture and how it can be fitted to the organisation, process modelling, process performance measurement, understanding process-related problems, process development, software tools for modelling and analysing processes, exercises.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 30h, exercises 12h, course assignments 45h, problem-based learning 27h, exam 20h. The course assignments will be done as group work, the lecture reflections and the exam will be done as individual work.

Target group:

Recommended optional programme components:
-

Recommended or required reading:
Harmon, Paul (2007). Business Process Change. A Guide for Business Managers and BPM and Six Sigma Professionals. Morgan Kaufmann Publishers.

Assessment methods and criteria:
This course unit utilizes continuous assessment. Lectures are voluntarily, but participation is highly recommended. The students will write lecture reflections, a problem-based learning report, and will create a process model with a software tool. In addition, there will be an exam at the end of the course, which will be assessed. The assessment of the course unit is based on the learning outcomes of the course unit.
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:
Karin Väyrynen

Working life cooperation:
No

815303A: Embedded Software Development Environments, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Juustila, Antti Juhani

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits / 133 hours of work
Timing:
1 st year of Master's and GS 3D studies, spring semester, period 4
Learning outcomes:
After completing the course, a student is able to work with the essential software development tools of a selected embedded platform. The student is able to implement memory and power efficient applications by exploiting existing libraries and knowledge of the programming interfaces provided by the platform.
Contents:
The focus of the course is in the software development environments and tools for mobile and embedded platforms, such as Android, iOS, and Windows Phone. In addition, the course covers memory and power management, core services of the platform, and the utilisation of existing libraries. One platform will be selected for deeper study, and the course introduces its essential software development tools and libraries. The emphasis is on application development for the platform as an exercise.
Mode of delivery:
Blended teaching
Learning activities and teaching methods:
Lectures and exercises about 40 h, exercises and exercise work 93 h
Prerequisites and co-requisites:
Course "815309A Real-time Distributed Software Development", C/C++ and/or Java programming skills or similar knowledge obtained from other courses.
Recommended or required reading:
Course material, the documentation of selected technologies, and other related literature
Assessment methods and criteria:
Exercise work
Grading:
1-5
Person responsible:
Antti Juustila

813626S: Emerging Technologies and Issues, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
1 st year of Master's and GS 3D studies, autumn semester, period 2
Learning outcomes:
 After completing the course, the student is able to **:**

- Analyse the on-going changes in online and consumer behaviour, customer requirements, ICT markets and technological development;
- Evaluate key enabling web technologies and become an effective participant in web-enabled business endeavours and initiatives;
- Design ways for leveraging information and communication technologies to improve intra- and inter-organisational processes and enhance a firm's competitive position;
- Plan ways for searching innovations; and

- Develop his/her skills for building careers and taking advantage of entrepreneurial opportunities through emerging technologies, in particular related to the web.

Contents:
1. A shift in thinking about the web and emerging technologies
2. How to social web is transforming businesses, software design, our perception of people as well as skills required of us
3. How to accelerate innovation creation through web-based and other emerging technologies: Ecosystem thinking, strategies, core business values
4. Transformation of the social web into humanized web

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 24h, reflective personal exercises 30h, independent work (required reading) 80h.

Target group:

Prerequisites and co-requisites:
None
Recommended optional programme components:

Recommended or required reading:
Oinas-Kukkonen Harri & Oinas-Kukkonen Henry (2013) Humanizing the Web: Change and Social Innovation. Palmgrave Macmillan, Basingstoke, UK (required reading).

Assessment methods and criteria:
Exam (only in English)

Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No

811600S: Emerging Trends in Software Engineering, 5 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Mika Mäntylä
Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits /133 hours of student work
Language of instruction:
English
Timing:
 1.-2. year of Master's studies, period 1-2
Learning outcomes:
The learning outcomes are defined based on course topic.
Contents:
Varies yearly.
Mode of delivery:
Face-to-Face teaching.
Learning activities and teaching methods:
Lectures, exercises, design exercise, group work and seminars depending on the topic of the year. The implementation of the course will be informed separately. 133 hours of student work.
Target group:
 All Master's level, EMSE, and GS3D students
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.
Grading:
 The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
 Mika Mäntylä
Working life cooperation:
No

811601S: Emerging Trends in Software Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Mäntylä

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/136 hours of work

Language of instruction:
 English
Timing:
1st year of Master's studies, autumn semester, period 2
Learning outcomes:
The student grasps the mathematical foundations of software testing and knows the current research areas related to software testing. The student is able to read research papers on software testing and can participate in academic discussions of those papers. The student can apply the software testing techniques in a test-driven fashion. .

Contents:
Finite state machines, data/ control flow graphs, data-flow testing, model-based testing, mutation/ search based testing, test case selection/ prioritization, security testing, test-driven development
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 24h, exercises/ assignments 24h, weekly study 48h, paper reading 40h
Target group:

Prerequisites and co-requisites:
815311A (Software Quality and Testing).
Recommended optional programme components:

Recommended or required reading:
  • Pezze M.,Young M., "Software Testing and Analysis: Process, Principles and Techniques", John Wiley&Sons, 2008
  • Lasse Koskela, "Test Driven: Practical TDD and Acceptance TDD for Java Developers", Manning Publications, 2007
Assessment methods and criteria:
Active and regular attendance (mandatory) to lectures and exercises
Grading:
 The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail
Person responsible:
 Mika Mäntylä

Working life cooperation:
No
Other information:
It is not possible to complete the course remotely or with self-study options.

812351A: Enterprise Systems, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Li Zhao

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
1st year of Master's and GS3D studies, spring semester, period 3

Learning outcomes:
After completing the course, the student:

- Understands how ERP, SCM, KM, CRM, global supply chain, inventory management, and online business systems operate;
- Understands how business processes integrate the internal functions of the enterprise and allow the enterprise to interact with its business environment (such as suppliers, business partners, and customers);
- Is able to recognize, model, and improve business processes to help enterprises achieve efficiency, effectiveness, and competitive advantage;
- Understands how to do research on enterprise information systems.

Contents:
1. Principles of enterprise systems, and business processes that integrate the internal functions of the enterprise and connect the enterprise with its business environment;
2. Manage enterprises' intellectual capital to achieve competitive advantage;
3. Enterprise resource planning (ERP);
4. Supply chain management (SCM);
5. Global supply chain & inventory management systems
6. Knowledge management systems;
7. Customer relationship management (CRM);
8. Internet-based Business and Marketing Systems;
9. Enterprise application integration (EAI)

Learning activities and teaching methods:
The overall workload for each student in this course is 134 hours. Lectures (24h), exercises (16h), homework (25h), essay (35 h), examination (34h)
Target group:

Prerequisites and co-requisites:
Understanding of the business process modeling helps.

Recommended optional programme components:

Recommended or required reading:
Refer to the course webpages
Assessment methods and criteria:
Exercises, assignments, essay, and examination.

Grading:
1–5
Person responsible:
Li Zhao
Working life cooperation:
No

Compulsory

812351A-01: Enterprise Systems, exercise work, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

812351A-02: Enterprise Systems, exam, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Arvostelu: 1 - 5, pass, fail
Opettajat: Li Zhao
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

817604S: ICT and Organizational Change, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Minna Isomursu
Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
2nd year, autumn semester, periods 1+2
Learning outcomes:
After completing the course the student is:

• Able to distinguish various levels of organisational activities and their relations;
• Able to discuss about the role of information technology in various levels of change of organisation and its context;
• Able to analyse ICT-based organizational change process.
Contents:
The course studies organisations at four levels: individuals, practices, organizational structures and transformations, and the societal context of organisations. The organizational role of ICT and the relation between ICT and knowledge are also discussed. A method for analysing organisations as networks of activity systems is presented. The role of power, trust and control in the change process is discussed. The different aspects of change agents are presented and analysed.
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Introductory lectures 20h, seminar sessions 14h, individual work 100h (for a review and analysis of selected course materials and making a presentation for the seminar).
Prerequisites and co-requisites:
B.Sc. or other equivalent degree and course Information Systems in Organisations (812304A) or equivalent knowledge.

Recommended optional programme components:

Recommended or required reading:
A list of research articles will be provided for the lectures and assignments. Readings for the background and theoretical framework are:
•   Gareth R. Jones (2010) Organizational Theory, Design, and Change: Global Edition (6. Ed.) Chapters 1-3, 10-12, Prentice Hall.
•   K. Kuutti (1996) Activity Theory as a potential framework for human-computer inter-action research, in Context and Consciousness: Activity Theory and Human Com-puter Interaction, B. Nardi, Editor. 1996, MIT Press: Cambridge. p. 17-44.
•   Frank Blackler (1995) Knowledge, knowledge work and organizations: an overview and interpretation. Organization studies, 1995. Pp. 1021-1046
•   Frank Blackler et al. (2000) Organizing Processes in Complex Activity Networks. Organization, vol. 7 no. 2. Pp. 277-300.
Assessment methods and criteria:
Lecture and seminar participation, assignment (literature review, analysis, seminar presentation). Alternatively by examination and personal assignment report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Minna Isomursu
Working life cooperation:
No

813623S: Information Security Policy and Management in Organisations, 5 op

Voimassaolo: 01.08.1950 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Pahnila, Petri Puhakainen
Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
2nd year of Master's and GS3D studies, autumn semester, period 2 + 3

Learning outcomes:
After completing the course, the student is able to:

•   Develop BPC;
•   Develop organisation specific information security policies and sub-policy systems in organisations;
•   Improve employees' compliance with the information security procedures through training, campaigning and other measures;
•   Carry out risk management in practice;
•   Estimate the economical investment in information security;
•   Understand the strengths and weaknesses of information security management stan-dards;
•   Understand the certifications in the area of information security management;
•   Design information security policies at organisations.
Contents:

1. BCP;
2. Development of organisation specific information security policies and sub-policy systems at organisations;
3. Measuring employees' compliance with information security policies;
4. Improving employees' compliance with the information security procedures through training, campaigning and other means;
5. Information security risk management in practice, estimation of economical investment in information security;
6. Information security management standards;
7. Certifications related to information security.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 30h, exercises 18h, student preparation and reading for exercises and examination 86h.

Target group:

Prerequisites and co-requisites:
Bachelor degree or other equivalent degree and course "811168P Introduction to Information Security" or principles of information security, or similar knowledge obtained from other courses.

Recommended optional programme components:

Recommended or required reading:
Articles (to be announced later)

Assessment methods and criteria:
Examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
1–5

Person responsible:
Petri Puhakainen ja Seppo Pahnila

Working life cooperation:
No

813625S: Information Systems Theory, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
English

Timing:
2nd year of Master's studies, autumn semester, periods 1 + 2

Learning outcomes:
 After completing the course, the student:

• Will have a good knowledge and understanding of a broad array of research topics and themes within the field of information systems;
• Will have good knowledge and understanding of information systems research and the process by which that research is produced;
• Can publish critical IS research articles in some of the leading academic journals and conference proceedings;
• Can critically analyse and synthesise academic sources;
• Can verbally present arguments in an academic fashion;
• Can write a literature review on an IS research topic.

Contents:
1. Information Systems Research Overview
2. A contemporary selection of IS research themes, such as:
• Information systems success and failure;

- Information systems development;
- Understanding the end-user;
- Risk management;
- Cultural Issues in information systems.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 1.5 ECTS credits (40.5 hours of work), class preparation 1.5 ECTS (40.5 hours of work), and exercises 2 ECTS (53 hours of work).

Target group:
Master's level students
Prerequisites and co-requisites:
Bachelor degree or other equivalent degree and "Research Methods" course (813621S). 813624S is a substantive overview of research in information systems not a methods course, and students should be familiar with research methods prior enrolling to 813624S.
Recommended optional programme components:

Recommended or required reading:
To be announced during the course implementation
Assessment methods and criteria:
Paper summary and its presentation, class quizzes, and research essay are assessed. Note that there is no final exam.
Grading:
1–5
Person responsible:
Netta Iivari
Working life cooperation:
No
Other information:
Course material can be found at OPTIMA e-learning environment, Urkund is used for course work submissions.

812331A: Interaction Design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Netta Iivari

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/133 hours of work
Language of instruction:
English
Timing:
1st year of Master's studies, autumn semester period 1
Learning outcomes:
Objective: The course explains the role of human interaction with IT products, systems, and services, explains the factors and problems related to it to motivate interaction design, and teaches some user-centered methods for analysis, evaluation and design of interactions.
Learning Outcomes: After completing the course, the student can assess the role of human interaction with IT products, systems, and services and identify factors and problems related to it within a practical design case. The student is able to:
- use methods for analysis and evaluation of existing interfaces;
- understand the role of requirements, plan and conduct a simple requirements collection and analysis;
- use basic principles of usability and user experience for user interface design;
- use interaction design methods in designing for target user experiences.
Contents:

The course provides an overview of interaction design, introducing the terminology and fundamental concepts, the main activities, and the importance of user involvement in the design process. The course addresses establishing requirements for IT products, systems, and services. The focus is on usability and user experience from the viewpoint of the intended users, their tasks and the context of use. The course covers user-centered methods for designing for and evaluating usability and user experience of IT products, systems, and services. All the main activities of interaction design are carried out in a practical design case.

Mode of delivery:
Face-to-face teaching, self-study
Learning activities and teaching methods:
Lectures (20 h), exercises and seminar (25 h), individual and group assignments (88 h), or self-study: an opening lecture (2 h), one larger assignment (110 h) and individual tasks (21 h).
Target group:
Master's level students of the IS Oriented Module (compulsory), Master's level students of the SE Oriented Module (optional) and GS ^{3}D students (optional).
Prerequisites and co-requisites:
Basic knowledge on human-computer interaction with usability and user-centered design.
Recommended or required reading:
Rogers, Sharp and Preece (2011, 3rd edition) *Interaction Design: Beyond Human-Computer Interaction* and related lecture and assignment materials
Assessment methods and criteria:
Accepted assignments and individual tasks

Grading:
1-5
Person responsible:
Netta Iivari
Working life cooperation:
No

812346A: Object Oriented Analysis and Design, 6 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

815657S: Open Source Software Development, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Henrik Hedberg
Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits / 133 hours of work
Timing:
1 st year of Master's studies, periods 1+2
Learning outcomes:
After passing the course, a student will be able to

- define the historical background and the ideology of Open Source Software (OSS),

- participate in OSS development project,

- evaluate the impact of the usage of OSS and OSS licenses on software development and exploitation, and

- view the phenomenon through the essential scientific research.

Contents:
The course introduces OSS development paradigm and current topics in OSS research. OSS affects both the way to produce software and the decisions of user organizations. It can be understood, for example, from different social, legal, economical, software engineering and data security viewpoints. The aim is to study from different perspectives, for example, what OSS is and what it is not, the history and organisation of OSS projects, methods of OSS development and usage, as well as licensing models and possible risks. The emphasis on research work.

Mode of delivery:
Mostly face-to-face teaching but some parts are implemented as distance learning
Learning activities and teaching methods:
Lectures and seminars about 40 h, exercises and peer reviews about 20 h, seminar article and presentation about 70 h
Prerequisites and co-requisites:
Compulsory prerequisites are Bachelor degree or other equivalent degree and basic knowledge on software engineering and research work. The course allows passing Project following the OSS development principles, or writing Master's thesis on a OSS topic.
Recommended or required reading:
Fogel, K. (2005): Producing Open Source Software - How to Run a Successful Free Software Project, O'Reilly Media; Rosen L. (2004): Open Source Licensing: Software Freedom and Intellectual Property Law, Prentice Hall; scientific articles covering the topic.
Assessment methods and criteria:
Active participation, seminar article and other assignments
Grading:
1-5
Person responsible:
Henrik Hedberg

817609S: Project Seminar, 3 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Tonja Molin-Juustila
Opintokohteen kielet: English

ECTS Credits:
3 ECTS credits / 70 hours of work
Language of instruction:
English.
Timing:
The timing of this course is dependent on the "Research and Development Project (817612S)" course and will immediately follow the project in the next semester: 2nd year, period 3.
Learning outcomes:
After completing the course, the students should demonstrate their abilities to work as academic experts in challenging ICT projects. Students will learn to acquire and apply research articles and other new knowledge like an academic expert in a selected topic of their project ("Research and Development Project (817612S)" course). Students will also learn to analyse and report their experience-based new knowledge on the topic to peer students. By completing this course, students are able to act as reflective, independent academic experts in ICT projects and have learnt expertise in some topic area of their project.
As an expert in the selected topic area, the student is able to
- Search research articles and literature on the topic (review);
- Report practical experiences gained during the project on the topic;
- Evaluate the results of the project and reflect the practical experiences against previous literature and research on the topic;

- Disseminate the (increased) expertise in the topic in a credible way to peers both by a written report and orally.

Contents:
Starting lecture, independent analysis and reporting of the expertise on the selected project topic and an expert seminar (1-2 days) with the presentations of each topic.

Mode of delivery:
Face-to-face teaching during the starting lecture and the seminar, private supervisor for each topic, and web-based learning environment.

Learning activities and teaching methods:
70h per student. Attendance at the starting lecture and the expert seminar is mandatory.

Target group:
Master's level students. Optional for the students of the Master's degree programme on Software, Systems, and Service Development (GS3D).

Prerequisites and co-requisites:
Mandatory: Research and Development Project (817612S) during the previous two periods. This course will immediately follow the project course on the project topics. For the students of the Master's degree programme on Software, Systems, and Service Development (GS3D), Software Factory Project Course (817611S) is mandatory before this course.

Recommended or required reading:
Research articles and material to be collected and studied by the students.

Assessment methods and criteria:
Expertise in the topic area will be reported on the seminar paper. Seminar presentation will also be evaluated. Assessment criteria will be given at the starting lecture and in the web-based learning environment of the course. Read more about assessment criteria at the University of Oulu webpage.

Grading:
Every member of the student group will get the same grade. The grade (scale 1-5) will be based 75% on the expertise in the topic and 25% on the oral presentation.

Person responsible:
Tonja Molin-Juustila

Working life cooperation:
No

815305A: Real Time Distributed Software Development, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Pulli

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/135 hours of work

Timing:
1 st year of Master's studies, autumn semester, periods 1 + 2

Learning outcomes:
After completing the course, the student:

- Is able to analyse the characteristics of real-time distributed systems;
- Is able to acquire an object-oriented, model-based approach to solve the design problems found in real-time systems;
- Is able to detect and derive specific problems facing the real-time software designer, and to suggest design patterns to solve those problems.

Contents:
Introduction
1. Characteristics of real-time systems;
2. Resource management;
3. Safety and reliability;

4. Time constraints;
5. Concurrency;
6. Scheduling;
7. Interrupts

Characteristics of Distribution
1. Distribution architectures
2. Concept of time;
3. Synchronisation;
4. Latency and jitter;
5. Quality of service;
6. Service discovery;
7. Networking primitives

Real-Time UML Modelling Methodology
Real-Time Design Patterns
Design Examples: Embedded, Ubiquitous, Mobile, Web/Internet

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 40h, design exercises 15h, student project 80h.

Prerequisites and co-requisites:
Student understands computer architecture, object-oriented analysis and design (UML), programming language C and/or Java.

Recommended or required reading:
Lecture notes based on reference books
- Douglass B.P. (2009) Real-Time Design Patterns – Robust Scalable Architecture for Real-Time Systems. Addison-Wesley ISBN 0-201-69956-7. 500 p.

Assessment methods and criteria:
Exam and project evaluation

Grading:
1-5

Person responsible:
Petri Pulli

813621S: Research Methods, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Arto Lanamäki

Opintokohteen kielet: English

Leikkaavuudet:

521146S   Research Methods in Computer Science   5.0 op

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
English

Timing:
The course starts in autumn and continues to spring semester (periods 2 and 3). It is recommended that the course is completed during the first year of Master's studies.

Learning outcomes:
Having completed the course, the student is able to explain the general principles of scientific research and the practices of scientific methodology. The student is also able to generate research problems in information systems and software engineering. The student is able to identify and describe the main research approaches and methods in information systems and software engineering and choose the appropriate approach and method for a research problem. The student is also able to evaluate the methodological quality of a research publication. After the course the student is able to choose and apply the proper approach and method for his or her Master's thesis and find more information on the method from scientific literature.

Contents:
Introduction to general scientific principles, scientific research practices and quality of scientific publications, qualitative research approaches and selected research methods, quantitative research approaches and selected research methods, design science research and selected methods, requirements and examples of Master's theses, evaluation of research.

Mode of delivery:
Face-to-face teaching and independent studying.

Learning activities and teaching methods:
Lectures 40h, exercises 30h and individual work 65h. Learning diary is written about the lectures and exercises. Exercises include group work.

Target group:

Prerequisites and co-requisites:
Completion of Bachelor's studies

Recommended optional programme components:

Recommended or required reading:
Lecture slides and specified literature

Assessment methods and criteria:
Accepted learning diary

Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
Pass/fail

Person responsible:
Arto Lanamäki
Working life cooperation:
No
Other information:
-

813620S: Software Business Management, 5 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Marianne Kinnula
Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
 English

Timing:
1 st–2 nd year of Master's studies, autumn semester, period 3

Learning outcomes:

Upon completion of the course, the student
- will be able to assess the main problem areas in software business management and is able to describe how to manage these problems;

- will be able to find, when needed, different kinds of tools for managing this diverse and ambiguous environment;
- will be able to describe how to manage competent and creative persons who often have strong personalities;
- will be able to analyse a company situation in a continually changing, unpredictable and even hostile environment, and is able to make well-grounded recommendations for the company courses of action;

Contents:
The software business environment and context is complex and under continuous change. Competences and creativity of company employees are needed for creating value and growth to the company. Managing a software business is a challenging task as traditional, rational management models are often inadequate for the needs of the managers. This course provides an overview of the management of the software business in a software company. Aspects of management of SME companies are discussed as well as significance of IT management in an organisation.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures and exercises 35h, group work 30h, course assignments and independent work 69h.

Prerequisites and co-requisites:
Basic knowledge of academic writing technique is needed. Basic understanding of the software business is an advantage.

Recommended optional programme components:

Recommended or required reading:
Course material and related literature.

Assessment methods and criteria:
Participation in lectures/exercises, group work, course assignments.

Grading:
1-5

Person responsible:
Marianne Kinnula

Working life cooperation:
No

815662S: Software Engineering Management, Measurement and Improvement, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Oivo, Markku Tapani

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work

Timing:
2 nd year of Master's and GS [3]D studies, autumn semester, period 2

Learning outcomes:
After completing the course the student understands the fundamental principles of software processes and their development in professional software engineering. The course extends the quality understanding based on individual techniques (e.g. reviews) so that after completing the course the student is able to:

- Evaluate different methods and techniques;
- Select from them appropriate ones for different software engineering environments;
- Have capabilities to participate in systematic efforts for improvement in software companies.

Contents:
The course covers the most fundamental process centred software quality improvement and management approaches, methods and latest research results, as well as approaches to software measurement. The topics of the course include: traditional waterfall, agile (extreme programming, scrum, rational unified process, crystal,

feature driven development, adaptive software development, dynamic systems development method) and lean methods, process improvement approaches, software process and product measurement, agile and lean practices, process improvement at the enterprise level and practical examples from software industry.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 18h, study group working 25h, paper reading 25h, seminar 20h, report writing 20h
Prerequisites and co-requisites:
 B.Sc. or other equivalent degree and basic knowledge of software engineering
Recommended or required reading:
- CMMI: Guidelines for Process Integration and Product Improvement. Mary Beth Chrissis, Mike Konrad, Sandy Shrum. Addison-Wesley, ISBN 032-115496-7, 2004.
- Agile Project Management with Scrum. Ken Schwaber, Microsoft Press, ISBN 0-7356-1993-X. 2004.
- Dingsøyr T., Dybå T., Moe N.B., Agile Software Development: Current Research and Future Directions, Springer, 2010
- C. Jones, Applied Software Measurement: Global Analysis of Productivity and Quality, 3rd ed. McGraw-Hill Osborne Media, 2008.
- Craig Larman and Bas Vodde, Scaling Lean & Agile Development: Thinking and Organizational Tools for Large-Scale Scrum, Addison-Wesley, 2009

Assessment methods and criteria:
Active and regular participation to lectures and seminars AND report evaluation AND seminar presentations
Grading:
1-5
Person responsible:
Markku Oivo

815663S: Software Engineering Research, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Burak Turhan

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/132 hours of work
Timing:
2 nd year of Master's studies, autumn semester, period 1+2

Learning outcomes:
After completing the course the student will know the current research areas in software engineering and the most important software engineering research methods. The student understands academic research and publishing in software engineering, and is able to critically analyse scientific articles from the viewpoint of the content and research methods used in the article. The student is able to present academic research and actively participate in an academic discussion of research papers and research results.
Contents:
Empirical research methods for software engineering: experiments, case studies, surveys, systematic literature reviews and replications in software engineering. Research topics in empirical software engineering.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures and seminars 33h, assignments and paper reading 33h, weekly study 66h.
Prerequisites and co-requisites:
B.Sc. or other equivalent degree
Recommended or required reading:
- Wohlin C., Runeson P., Höst M., Ohlsson M., Regnell B., Wesslen A., Experimentation in Software Engineering, Springer, 2012,.
- Per Runeson, Martin Host, Austen Rainer, Bjorn Regnell: Case Study Research in Software Engineering: Guidelines and Examples, Wiley, 2012.

Assessment methods and criteria:
Active and regular attendance (mandatory) to lectures and seminars.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail

Person responsible:
Burak Turhan
Other information:
It is not possible to complete the course remotely or with self-study options.

815312A: Software Production and Maintenance, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Saukkonen, Samuli

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/133 hours of work
Timing:
1 st year of Master's and GS ^{3}D studies, spring semester, period 3
Learning outcomes:
After completing the course, the student:

- Can apply the framework of product line engineering in large scale software production;
- Can apply the maintenance process and techniques in software production.

Contents:
Product line engineering
1. Product line variability;
2. Domain engineering;
3. Application engineering;
4. Transition strategies and organisational issues.
Software maintenance
1. Categories of maintenance;
2. Corrective maintenance;
3. Other forms of maintenance.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20h, study group working and weekly discussion sessions with the teacher on 8 assignments, together with report writing, 113h.
Prerequisites and co-requisites:
 Basic knowledge of software engineering and software architectures.
Recommended or required reading:
- Pohl, K., Böckle, G., van der Linden, F. Software Product Line Engineering. Foundations, Principles, and Techniques, Springer-Verlag, 2005; chapters 1-5, 10, 15, 19-20.
- Chastek G.J., Donohoe P., McGregor J.D., Formulation of a Production Strategy for a Software Product Line, Technical Note CMU/SEI-2009-TN-025, Carnegie Mellon, 2009
- Gopalaswamy, R., Ramesh, B., Software maintenance: effective practices for geographically distributed environments, Tata McGraw-Hill, 2006 - Computers - 456 pages; chapters 1-6.

Assessment methods and criteria:
 Active participation: 8 weekly assignments to be assessed separately. The final grade will be the sum of all assignments. "Conventional" participation: written exam.
Grading:
1-5
Person responsible:
Samuli Saukkonen

815311A: Software Quality and Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Burak Turhan

Opintokohteen kielet: English

Leikkaavuudet:

ay815311A   Software Quality and Testing (OPEN UNI)   5.0 op

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
  1 st year of Master's studies, autumn semester, period 1
Learning outcomes:
The student understands different views on software quality and the role of reviews, inspection and testing as a part of software engineering and defect removal techniques. The student can conduct the review as part of review team and use an appropriate supporting tool. The student knows testing levels, strategies and techniques, can create test cases and conduct unit testing with appropriate testing tools. The student knows the possibilities of test driven development, test automation and models for reviewing.
Contents:
Software quality and quality assurance. Software reviews and inspection. Fundamental concepts of software testing. Software testing techniques. Test-driven development. Test automation.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 32h, study group working 24h, paper reading 24h, exercises 24h, report writing 30 h
Target group:

Prerequisites and co-requisites:
Basic knowledge of software engineering, knowledge of Java programming language.
Recommended optional programme components:

Recommended or required reading:
To be announced during the course implementation but initially planned to be:
• Pezze M.,Young M., "Software Testing and Analysis: Process, Principles and Tech-niques", John Wiley&Sons, 2008
• A. P. Mathur, "Foundations of Software Testing", Prentice Hall, 2008
• Paul Ammann, Jeff Offutt, "Introduction to Software Testing", Cambridge University Press, 2008
• Kent Beck, "Test-Driven Development by Example", Addison-Wesley, 2002
• Lasse Koskela, "Test Driven: Practical TDD and Acceptance TDD for Java Devel-opers", Manning Publications, 2007
• Galin D., "Software Quality Assurance: From theory to implementation", Addison-Wesley, 2004
Assessment methods and criteria:
Report and exercise evaluation, active and regular attendance to lectures and exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
 Burak Turhan
Working life cooperation:
No

817603S: System Design Methods for Information Systems, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Li Zhao

Opintokohteen kielet: English

ECTS Credits:
5 credits/134 hours of work

Language of instruction:
English
Timing:

1 st year of Master's Studies, autumn semester, period1.

Learning outcomes:
Objective: The objective of the course is to widen students' understanding of methodologies and techniques for information systems development (ISD) and provide students with skills in using the variety of techniques.

Learning Outcomes: After the course the student understands the complexity of business, organizational, technical, and human aspects that affect ISD and the selection of methods in ISD. The student also understands the defects of traditional waterfall model and how other methods aim to answer to these defects and to other challenges in ISD. In particular, with socio-technical methods (e.g., SSM, ETHICS) and their techniques the student is able to re-plan and develop the sub-systems (automated and non-automated) of organization into a coherent whole and to take into account job satisfaction issues in addition to efficiency demands in ISD and in planning workflows in organization. The student is also able to assess and give arguments which method is suitable for an ISD project in an organization.
Contents:
What is information systems development (ISD), waterfall method, socio-technical methods like SSM and ETHICS, miscellaneous methods or frameworks like evolutionary approach, prototyping, rapid application development, Agile development, XP, business process re-engineering, process innovation, stakeholders analysis, and critical success factors, as well as how to select ISD methods.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20h, exercises 24h, homework 30h, essay 30h, examination 30h.
Target group:

Prerequisites and co-requisites:
Bachelor studies recommended

Recommended optional programme components:

Recommended or required reading:
Avison, D., Fitzgerald, G. (2006) Information Systems Development, methodologies, techniques & tools. Fourth Edition. London: McGraw-Hill.
Research articles (to be announced during the course implementation).

Assessment methods and criteria:
Exercises, assignments, essay, and examination.
Grading:
1-5
Person responsible:
Li Zhao
Working life cooperation:
No

811375A: User Interface Programming, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Lappalainen, Jouni Esko Antero
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
Finnish
Timing:
3 rd year, autumn semester, periods 1 + 2
Learning outcomes:
After completing the course, the student can implement a software application that utilises a database for storage and has a graphical user interface. The GUI (as well as the entire application) must be developed by implementing usability design principles from the beginning of the development process.

Contents:
The course deals with the following: UI elements, foundations of the Swing library, UI design principles, layout managers, MVC-paradigm, event-driven programming, web-usability, JSP, programmatically utilising databases, JDBC, web-programming.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Exercise 33h, coursework 75h, independent study 26h.
Target group:

Prerequisites and co-requisites:
Knowledge and skills of the course "811380A Basics of Databases" and fundamentals of user interface design. In addition, the knowledge and skills of object-oriented programming are needed.
Recommended optional programme components:

Recommended or required reading:
Lectures in textual format within the course web space. In addition (if needed), for example Kosonen, Peltomäki & Silander (2005). Java 2 ohjelmoinnin peruskirja. Docendo. In addition, Lauesen, S. 2005. User Interface Design: A Software Engineering Perspective.
Assessment methods and criteria:
The student must submit coursework that fulfils the given requirements (defined during the course).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5 / fail
Person responsible:
Jouni Lappalainen
Working life cooperation:
No