Opasraportti

The Department of Information Processing Science (2014 - 2015)

Tutkintorakenteet

Degree Programme in Information Processing Science, Bachelor Level Studies

Tutkintorakenteen tila: published

Lukuvuosi: 2014-15

Lukuvuoden alkamispäivämäärä: 01.08.2014

General Studies (vähintään 3 op)

810029Y: Orientation studies, 3 op

Language and Communication Studies (vähintään 10 op)

Students may perform individually applying for a foreign language written and oral part, the English language instead of French or German language

902002Y: English 1 (Reading for Academic Purposes), 2 op
902004Y: English 2 (Scientific Communication), 2 op
901004Y: Swedish, 2 - 3 op
900050Y: Written and Oral Communication Skills, 4 - 5 op

Basic Studies (vähintään 44 op)

810124P: Computer Architecture, 6 op
811120P: Discrete Structures, 5 op
811171P: Humans as Users and Developers of Information Technology, 4 op
811168P: Information Security, 5 op
030005P: Information Skills, 1 op
810136P: Introduction to Information Processing Sciences, 5 op
811169P: Introduction to Information Systems Design, 6 op
811192P: Introduction to Programming in C, 5 op
811174P: Introduction to Software Business, 5 op
811176P: Programming Assignment, 2 op

Intermediate Studies (vähintään 98 op)

811383A: Bachelor Thesis, 7 op
811380A: Basics of Databases, 7 op
811379A: Basics of Human Computer Interaction, 5 op
811147A: Basics of Statistical Data Analysis for Information Processing Science, 4 op
813316A: Business Process Modeling, 5 op
811312A: Data Structures and Algorithms, 5 op
812304A: Information Systems in Organizations, 6 op
812334A: Information systems planning, 6 op
811338A: Internet and Computer Networks, 5 op
811382A: Introduction to research work, 4 op
812346A: Object Oriented Analysis and Design, 6 op
812347A: Object-Oriented Programming, 6 op
811365A: Project I, 7 op
811311A: Project Management Principles, 3 op
811391A: Requirements Engineering, 5 op
815347A: Software architectures, 6 op
811335A: Software engineering, 6 op
811375A: User Interface Programming, 5 op

Minor Studies (vähintään 25 op)

The bachelor's degree includes at least 25 credits from compulsory minor subjects. Recommended minor subjects include statistics, maths, engineering, economics and Work Science. Basic study modules are usually presented in minor subjects providing data for municipalities, departments and study guides. These subjects can also be carried out at other universities and colleges as well as the Open University.

Degree Programme in Information Processing Science, Master's Level Studies

Tutkintorakenteen tila: published

Lukuvuosi: 2014-15

Lukuvuoden alkamispäivämäärä: 01.08.2014

Compulsory Studies for all Master's Level Students (vähintään 51 op)

813613S: Master's Thesis, 30 op
813602S: Master's thesis seminar, 2 op
817606S: Project II (Project in Distributed Global Context), 11 op
817609S: Project Seminar, 3 op
813621S: Research Methods, 5 op

Specialization Studies (vähintään 39 op)

For the master’s studies, a student should choose either information systems or software engineering as his/her study orientation. The choice will be made at the end of the bachelor studies or at the latest at the beginning of the master’s studies, by defining it explicitly as part of the personal study plan.

Software Engineering Oriented Module

815308A: Embedded Software Development Environments, 4 op
815653S: Open Source Software Development, 4 op
815309A: Real Time Distributed Software Development, 6 op
817602S: Software Development in Global Environment, 5 op
815660S: Software Engineering Management, Measurement and Improvement, 4 op
815661S: Software Engineering Research, 7 op
815310A: Software Production and Maintenance, 4 op
815311A: Software Quality and Testing, 5 op

Information Systems Oriented Module

813619S: Emerging Technologies and Issues, 4 op
812350A: Enterprise Systems, 4 op
817604S: ICT and Organizational Change, 5 op
812349A: IT Infrastructure, 5 op
813623S: Information Security Policy and Management in Organisations, 5 op
813624S: Information Systems Theory, 7 op
812335A: Interaction Design, 4 op
817603S: System Design Methods for Information Systems, 5 op

Optional Studies (vähintään 30 op)

Optional studies must be at least 30 ECTS credit points. Optional courses can be chosen either in the advanced (Advanced Module) supply or the second specialisation option compulsory courses, or both. Also a minor, or carried out elsewhere in higher education approved elective courses.

Optional Studies for IS Oriented Module Students

817610S: Doing Software Business in China, 5 op
815308A: Embedded Software Development Environments, 4 op
815653S: Open Source Software Development, 4 op
815309A: Real Time Distributed Software Development, 6 op
814340A: Small-Group Tutoring, 3 op
817602S: Software Development in Global Environment, 5 op
815660S: Software Engineering Management, Measurement and Improvement, 4 op
815310A: Software Production and Maintenance, 4 op
815311A: Software Quality and Testing, 5 op
812670S: The Next Generation of the Web, 5 op
812671S: Usability Testing, 5 op
814601S: Work Experience in ICT responsibilities, 5 op

Optional Studies for SE Oriented Module Students

817610S: Doing Software Business in China, 5 op
813619S: Emerging Technologies and Issues, 4 op
812350A: Enterprise Systems, 4 op
812349A: IT Infrastructure, 5 op
813623S: Information Security Policy and Management in Organisations, 5 op
814340A: Small-Group Tutoring, 3 op
817603S: System Design Methods for Information Systems, 5 op
812670S: The Next Generation of the Web, 5 op
812671S: Usability Testing, 5 op
814601S: Work Experience in ICT responsibilities, 5 op

Minor or other studies

Masters Degree Programme in Software, Systems and Service Development (GS3D)

Tutkintorakenteen tila: published

Lukuvuosi: 2014-15

Lukuvuoden alkamispäivämäärä: 01.08.2014

Compulsory Studies (vähintään 95 op)

817604S: ICT and Organizational Change, 5 op
812349A: IT Infrastructure, 5 op
813623S: Information Security Policy and Management in Organisations, 5 op
813624S: Information Systems Theory, 7 op
813613S: Master's Thesis, 30 op
815653S: Open Source Software Development, 4 op
810129P: Orientation Studies for International Students, 4 op
813621S: Research Methods, 5 op
813630S: Software Business Development, 5 op
813620S: Software Business Management, 5 op
817602S: Software Development in Global Environment, 5 op
815660S: Software Engineering Management, Measurement and Improvement, 4 op
815661S: Software Engineering Research, 7 op
817611S: Software Factory Project Course, 11 op
817603S: System Design Methods for Information Systems, 5 op

Optional Studies (vähintään 25 op)

Optional studies must be at least 25 ECTS credit points. Optional courses can be chosen in the optional course pool (see below). Also a minor, or carried out elsewhere in higher education approved elective courses.

812650S: Advanced Topics in Digital Cultures and Design, 5 op
817610S: Doing Software Business in China, 5 op
815308A: Embedded Software Development Environments, 4 op
813619S: Emerging Technologies and Issues, 4 op
812350A: Enterprise Systems, 4 op
812335A: Interaction Design, 4 op
817609S: Project Seminar, 3 op
815309A: Real Time Distributed Software Development, 6 op
815310A: Software Production and Maintenance, 4 op
815311A: Software Quality and Testing, 5 op
812670S: The Next Generation of the Web, 5 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

811336A: Cooperation in information processing, 1 - 5 op
813631S: Ethics of Information Systems: Classical Foundations and Current Issues, 5 op
812651S: ICT and Behaviour Change, 5 op
814311A: Internship in ICT-duties, 3 - 5 op
811392A: Preparatory Course for MSc Studies, 5 op
815338A: Principles of Programming Languages, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

810029Y: Orientation studies, 3 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Heli Alatalo

Opintokohteen kielet: Finnish

ECTS Credits:
ECTS credits: 3 ECTS credits/80 hours of work.
Language of instruction:
Finnish
Timing:
1st year, autumn and spring semester, periods 1+2+3+4.
Learning outcomes:
After passing the course a student:

- Recognises from the viewpoint of his/her university studies the actions and services of the most important units, organisations and societies and his/her action possibilities in them;
- Recognises the characteristics of the university-level studies, own curriculum and the discipline of Information Processing Science from the viewpoint of his/her stud-ies and their planning;
- Is able to discuss on the purpose of his/her studies and the upcoming study path;
- Is able to create and present his/her own Personal Study Plan (PSP);
- Knows the city of Oulu and its services.

Contents:
1. Common occasions and lectures, 2. Small group activities (student tutoring), 3. PSP process, 4. Science library Tellus and Oula database, 5. Teacher tutoring.

Mode of delivery:
Face-to-face teaching and web-based teaching.
Learning activities and teaching methods:
Common occasions and lectures 16h, small-group activities (student tutoring) 15h, PSP process 8h, independent personal work 25h and teacher tutoring 16h.
Target group:
1st year
Recommended or required reading:
Lecture materials, www-pages, study guides, brochures and forms.
Assessment methods and criteria:
Active participation in lectures, common occasions, small group activities (student tutoring) and teacher tutoring. Creating and returning PSP to WebOodi.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Approved / failed.
Person responsible:
Heli Alatalo

902002Y: English 1 (Reading for Academic Purposes), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:
B2/C1 on the Common European Framework of Reference scale.
Status:
In the Faculty of Science, this course is mandatory for all degree programmes except Geography. Please consult the Faculty Study Guide to establish the language requirements for your own degree programme.

Required proficiency level:
English must have been the A1 or A2 language at school or equivalent English skills should have been acquired otherwise.
ECTS Credits:
2 ECTS credits (total work load 54 hours including classroom meetings.)
Language of instruction:
English
Timing:
Biology: 1st year spring term
Chemistry: 1st year autumn term
Geology: 1st year spring term
Information Processing Science: 1st year spring term
Mathematical Sciences: 1st year spring term
Physical Sciences: 1st year autumn term
Learning outcomes:
By the end of the course, you are expected

- to have acquired effective vocabulary learning techniques by being able to distinguish parts of words to infer meanings
- to understand and be able to construct basic grammatical structures used in formal written English
- to be able to utilize text structure and cohesion markers when reading academic texts
- to be able to apply effective reading techniques and have necessary skills to extract global and detailed information with considerable ease and speed from general texts related to Natural Sciences as well as texts /textbooks of their own field

Contents:
In this course, students improve their understanding of written academic English used in texts in Natural Sciences as well as expand their general and scientific vocabulary. Students become aware of their own role in learning and use a variety of different study methods in order to develop their own language learning strategies, which will enhance their academic English.
Mode of delivery:
Contact teaching
Learning activities and teaching methods:
Contact teaching (26 hours) and self-study 28 hours
Target group:
1 st year students of Biology, Chemistry, Geology, Information Processing Science, Physics, and Mathematics
Prerequisites and co-requisites:
-
Recommended optional programme components:
In addition to this course, students are required to take 902004Y Scientific Communication.
Recommended or required reading:
Set books for substance studies; journal articles in print and on-line.
Assessment methods and criteria:
Continuous assessment takes into account active and regular participation in classroom sessions and successful completion of all homework tasks, vocabulary quizzes, and an end of course exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/Fail
Person responsible:
Biology, Geology, Information Processing: Karen Niskanen
Chemistry, Physics, Mathematics: Patrick Nesbitt
Working life cooperation:
-
Other information:
N.B. Students with grades *laudatur* or *eximia* in their A1 English school-leaving examination can be exempted from this course and will be granted the credits by the Faculty of Science.
Retake examinations: Two retake examinations are allowed on the dates set by the Extension School. See the dates and registration instructions at: http://www.oulu.fi/kielikoulutus

902004Y: English 2 (Scientific Communication), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay902004Y English 2 (Scientific Communication) (OPEN UNI) 2.0 op

Proficiency level:
B2/C1 on the CEFR scales
Status:
This course is mandatory for all 2nd year students (except **geographers**) who will have English as their foreign language in their B.Sc. degree. This includes the students who were exempted from 'Reading for Academic Purposes'(902002Y). Please consult the faculty study guide to establish the language requirements on your own degree programme.
Required proficiency level:
Students taking this course must have had English as the A1 or A2 language at school or the equivalent English skills should have been acquired otherwise. The course 'Reading for Academic Purposes' (902002Y) is a pre-requisite, unless exempted.
ECTS Credits:
The student workload is 53 hrs work/ 2 ECTS credits.
Language of instruction:
English
Timing:
Biology: 2nd year autumn term
Chemistry: 2nd year spring term
Geology: 2nd year spring term
Information Processing Science : 2nd year autumn term
Mathematics: 2nd year spring term
Physics: 2nd year autumn term
Learning outcomes:
By the end of the course, you are expected:

1. to have provided evidence of oral fluency in pair work communication and small group discussions.
2. to have developed effective language learning strategies through autonomous homework.
3. to have demonstrated the ability to prepare and present scientific subjects, using appropriate field-related vocabulary.
4. to have demonstrated lecture listening skills in field-related situations.

Contents:
Skills in listening, speaking, and giving presentations are practised in the course. Homework tasks include autonomous work to support the classroom learning and the task of preparing and presenting a scientific presentation.
Mode of delivery:
Contact teaching
Learning activities and teaching methods:
Contact teaching 28 hours, homework 28 hours
Target group:
2nd year students of Biology, Chemistry, Geology, Information Processing Science, Mathematics, Physics
Prerequisites and co-requisites:
-
Recommended optional programme components:
Also required: 902002Y Reading for Academic Purposes Englannin kieli 1
Recommended or required reading:
Course materials will be provided by the teacher.
Assessment methods and criteria:
Continuous assessment is based on regular attendance, active participation in all lessons and the successful completion of all homework tasks.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / fail.
Person responsible:
Jolene Gear
Working life cooperation:
-
Other information:
Alternative method of course completion: An optional exemption test is offered twice per year. The student can only participate in the exemption exam once. See exemption exam details and schedule.

901004Y: Swedish, 2 - 3 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Opintokohteen kielet: Swedish

Leikkaavuudet:

901035Y	Second Official Language (Swedish), Oral Skills	1.0 op
901034Y	Second Official Language (Swedish), Written Skills	1.0 op
ay901004Y	Swedish (OPEN UNI)	2.0 op

Proficiency level:
B1/B2/C1 (CEFR scale)
Status:
This course is compulsory to all students except those who have at least 60 ECTS credits of Swedish studies in their degrees. The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481/03).
Required proficiency level:
The required starting proficiency level for students of all faculties is a grade of 7 or higher from the Swedish studies at secondary school (B-syllabus) or matriculation examination grade A - L or a passing grade from the Brush up course in Swedish 901018Y.
If a student doesn't meet these requirements or his/her language skills are otherwise lacking, he/she must achieve the required proficiency level BEFORE taking this compulsory Swedish course
ECTS Credits:
2 ECTS credits (Biochemistry 3 ECTS credits)
Language of instruction:
Swedish
Timing:
See the study guide of your own faculty
Learning outcomes:
Upon completion of the course the student should have acquired the necessary proficiency level in Swedish to be able to manage in the most common communication situations related to his/her professional work tasks. He/she should be able to use basic grammatical structures fairly well in both speech and writing. He/she should be able to use the most common situational phrases understandably in various communication situations. He/she should be able to find the main points in general academic texts and texts related to his/her field of study and relay this information to colleagues or an audience of laymen using Swedish. He/she should be able to write short texts relating to his/her field of study.
Contents:
Communicative oral and written exercises, which aim to develop the student's Swedish proficiency in areas relevant to his/her academic field and future professional tasks. The student practises oral presentation and pronunciation. Situational oral exercises done individually and in pairs and groups. Discussions in small groups. Current texts about the student's special field. Listening comprehension exercises. Written exercises relating to the student's professional field.
Mode of delivery:
Contact teaching
Learning activities and teaching methods:
2 ECTS credits: 28 hours of contact teaching (1 x 180 minutes per week) and related exercises, self-directed study. The course unit's total workload is 53 hours.
Target group:
Students of the Faculty of Science, students of biochemistry and students of electrical engineering.
Prerequisites and co-requisites:
See Required Porficiency Level
Recommended optional programme components:
-
Recommended or required reading:
The material, which is special field-specific, authentic and up to date, is distributed during the course. Students must pay for their course material.
Assessment methods and criteria:
The course focuses on improving both oral and written language skills and requires active attendance and participation in exercises, which also require preparation time. 100% attendance is required. The course unit tests both oral and written language skills. Students participate in the teaching in either autumn semester or spring

semester.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
Assessment is based on continuous assessment and exams. Approved completion of the course unit requires that the student achieves at least satisfactory oral and written language skills. The grades are based on continuous assessment and the course exams. Oral and written language skills are graded separately. The possible grades are satisfactory skills (CERF proficiency level B1) and good skills (CERF proficiency levels B2-C1). For more information on the proficiency levels of oral and written language skills, see Assessment Criteria (in Finnish).
Person responsible:
Lecturer Rauno Varonen
Working life cooperation:
-
Other information:
Teaching will begin according to the schedule

900050Y: Written and Oral Communication Skills, 4 - 5 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900050Y Written and Oral Communication Skills (OPEN UNI) 4.0 op

Proficiency level:
-
Status:
Compulsory (See below)
Required proficiency level:
-
ECTS Credits:
4 - 5 crdeits
Language of instruction:
Finnish
Timing:
-
Learning outcomes:
-
Contents:
-
Mode of delivery:
-
Learning activities and teaching methods:
Students in the Faculty of Humanities select their written and oral communication studies from the course units offered in the Communication Buffet in such a way that the selected course units include both written and oral studies. With most of the course units, the student has the option to choose between versions worth 2 credits or 3 credits; the student may choose to take a 3 credit written skills course and a 2 credit oral skills course - or vice versa - to form the required total amount of 5 credits. The student must discuss the additional assignments required for the 3 credit version with the teacher of the course unit in question. It is also possible to complete the communication studies with one course unit, which combines both oral and written studies and is worth 5 credits.
Students of Saami Language and Saami Culture complete the Communication Buffet course unit 900050Y-04 Scientific Communication (Tieteellinen viestintä) - 5 ECTS credits.
Students in the Master's Degree Programme in Business Communication may complete their communication studies by taking the course unit 900055Y Communication Skills in Business and Economic Life (Talouselämän viestintä)(3 ECTS credits) intended for students of Economics and one freely selectable course unit (2 ECTS credits) from the Communication Buffet.

Faculty of Information Technology and Electrical Engineering
Students of Information Processing Science complete the course unit in teaching groups reserved for them by

either taking the course unit 900050-27 Scientific Communication (TOL) (Tieteellinen viestintä [TOL]) - 4 ECTS credits (Option A) **OR** the course units 900050Y-18 Written Communication 1 (TOL) (Kirjoitusviestintä [TOL]) - 2 ECTS credits and 900050Y-26 Oral Communication (TOL) (Puheviestintä [TOL]) - 2 ECTS credits (Option B).
Target group:
See above
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
-
Read more about assessment criteria at the University of Oulu webpage.
Grading:
-
Person responsible:
See Contact teachers of Languages and Communication
Working life cooperation:
-
Other information:
-

810124P: Computer Architecture, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Pulli

Opintokohteen kielet: Finnish

ECTS Credits:
6 ECTS credits/160 hours of work

Language of instruction:
Finnish
Timing:
1 st year, spring semester, period 3
Learning outcomes:
After completing the course, a student understands and manages the software platform for the performance of the structure and activities related to performance, resource needs, and error situations. Students master the basic vocabulary, which is able to communicate and document the software development, particularly in the nearby device applications such as embedded software, mobile systems, multimedia and scientific computing. Students will be able to use and work with computers in their first job as a professional.

Contents:
1. Basics of digital logic and components of a processor
2. Display formats of digital information
3. The processor and its functions
4. The processor instruction set (MIPS and IA32)
5. Assembly language
6. Memory management
7. Input and output
8. Interrupts, device drivers and BIOS
9. Multimedia support
10. Mobile processors
11. Parallel computing

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:
Lectures 40h, home exercises 15h, laboratory exercises 15h, examination 90h
Target group:

Recommended optional programme components:
-
Recommended or required reading:
Comer; D.E., Essentials of Computer Architecture. Pearson/Prentice Hall. ISBN 0-13-106426-7. 2005. 369 s.

Also examples of the following books are used in lectures:

Tanenbaum A.S., Structured Computer Organizations. 4th Edition. Prentice Hall. 1999. 700 s.
Stallings, W. Computer Organization and Architecture. 5th Edition. Prentice Hall. 2000. 768 s.

Assessment methods and criteria:
Examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Petri Pulli
Working life cooperation:
No

811120P: Discrete Structures, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
finnish
Timing:
1st year, period 1
Learning outcomes:
The student is able to interpret simple mathematical notation and write it by himself/herself. He/she can define the most important concepts that appear in the basic theoretical structures (see Contents) accurately and describe the idea of the definitions. The student also masters the most essential results and (algorithmic) methods of the basic structures and is capable of applying them in easy examples. He/she is able to evaluate certain kinds of simple practical problems in computer science, to choose appropriate theoretical methods to solve the problems, and finally to apply the chosen methods.

Contents:
1. The concept of algorithm;
2. Number systems and the conversion of bases;
3. Logic (proposition calculus, predicate calculus basics);
4. Set theory, relations and functions (finiteness/infinity, induction);
5. Basic number theory (divisibility and the respective algorithms);
6. Combinatory (principles of counting);
7. Graph theory.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 40h, exercises 30h, autonomous work about 64h.

Prerequisites and co-requisites:
Mastering basic mathematical knowledge as is presented in the high school short mathematics syllabus.
Recommended or required reading:
Lecture slides (about 250 slides), lecture notes (about 100 pages), textbook: Peter Grossman, Discrete Mathematics for Computing, Second Revised Edition, Palgrave Macmillan, 2002. ISBN: 978-0333981115.
Assessment methods and criteria:
Lectures by final exam; mandatory exercises by self-contained work.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Juha Kortelainen
Working life cooperation:
No

811171P: Humans as Users and Developers of Information Technology, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Tonja Molin-Juustila

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811171P	Humans as Users and Developers of Information Technology (OPEN UNI)	4.0 op

ECTS Credits:
4 ECTS credits/108 hours of work
Language of instruction:
Finnish
Timing:
1st year, autumn semester, period 2
Learning outcomes:
After completing the course, students will be able to examine humans as both users and developers of information technology. The student learns core concepts of the phenomenon, and understands their meaning in relation to practice. Students are also familiar with the background of usability research and some of its scientific theories. Students are able to observe and specify a variety of use situations and user experiences of information technologies. Students also understand the challenges of the information technology developers when targeting to create pleasant use experiences for the users of these technologies. After completing the course, students also realize they have started their own journey to become an expert in information technology development.

Contents:
The key themes and concepts of the course are the diversity of information technology, humans as users and developers of information technology, usability, use and user experience, user-centred design.
Mode of delivery:
Face-to-face teaching and self-studying supported with web-based learning.
Learning activities and teaching methods:
Lectures (24h), lecture tasks, exam and work on separate written tasks (about 84h)
Target group:

Recommended or required reading:
Antti Oulasvirta (ed.): “Ihmisen ja tietokoneen vuorovaikutus” (2011), parts I and II. In addition, the material during lectures and other supplementary material.
Assessment methods and criteria:
Course assessment is mainly based on the pre-assignment, lecture assignments, exam and individual essay. In addition, one may improve one’s own grade by optional advanced assignment. Assessment criteria will be available in the web-based learning environment.
Read more about assessment criteria at the University of Oulu webpage.
Grading:

1-5
Person responsible:
Tonja Molin-Juustila
Working life cooperation:
No

811168P: Information Security, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811168P Information Security (OPEN UNI) 5.0 op

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
Finnish
Timing:
1st year, spring semester, period 4
Learning outcomes:
After completing the course, a student remembers the main features of the history of information security and is able to define essential security concepts. She/he recognises the different phases of security systems development, is able to evaluate their contents and can describe the fundamental characteristics of planning for security. The student is capable on a basic level of analysing the main scientific methods of information security (risk management, encryption, authentication, access control, etc.) and can explain the functioning of the most important security algorithms and protocols. She/he is able to solve small-scale problems in encryption and authentication and can use security software tools whose functioning principles he/she understands.
Contents:
1. History and basic structures;
2. The need and concepts of information security;
3. Risk management;
4. Planning of security;
5. Cryptography;
6. Access control;
7. Security protocols;
8. Software security;
9. Implementing information security;
10. Information security maintenance.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 40h, exercises 30h, autonomous work about 64h
Target group:

Prerequisites and co-requisites:
Mastering the material presented in the courses “811120P Discrete Structures” and “811338A Internet and Computer Networks”.

Recommended optional programme components:

Recommended or required reading:
Lecture slides (about 250 slides), lecture notes (about 100 pages), textbook: M. Whitman and H. Mattord, H., Principles of Information Security 2nd ed., Thomson Course Technology, Boston, 2005. ISBN 0-619-21625-5

Assessment methods and criteria:

Lectures by final exam; mandatory exercises by self-contained work
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Juha Kortelainen
Working life cooperation:
No

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivuniemi, Mirja-Liisa, Sassali, Jani Henrik

Opintokohteen kielet: Finnish

Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:
1 ECTS credit
Language of instruction:
Finnish
Timing:
2nd or 3rd year
Learning outcomes:
Students know the different phases of information retrieval process and basic techniques of scientific information retrieval. They will find the most important reference databases of their discipline and know how to evaluate information sources and retrieval results.
Contents:
Retrieval of scientific information, the retrieval process, key databases of the discipline, and evaluation of information retrieval and information sources.
Mode of delivery:
Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student's own choice
Learning activities and teaching methods:
Training sessions 8h, group working 7h, self-study 12h
Target group:
Compulsory for all students of the Faculty of Technology, the Faculty of Information Technology and Electrical Engineering and the Faculty of Architecture. In the Faculty of Science compulsory for students of biology, physics, geosciences, chemistry and geography. Optional for students of biochemistry and mathematics.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Web learning material https://wiki.oulu.fi/display/030005P.
Assessment methods and criteria:
Passing the course requires participation in the training sessions and successful completion of the course assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
pass/fail
Person responsible:
Science and Technology Library Tellus, tellustieto (at) oulu.fi
Working life cooperation:
-
Other information:
-

810136P: Introduction to Information Processing Sciences, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay810136P Introduction to information processing sciences (OPEN UNI) 5.0 op

ECTS Credits:
5 ECTS credits/135 hours of work
Language of instruction:
Finnish
Timing:
1st year of Bachelor studies, autumn semester, period 1
Learning outcomes:
Students are able to complete information searches belonging to subject areas related to the course, analyse the information they have found and write short reports and essays.
Contents:
The course consists of lectures of various aspects of computer science and current research. Practical working life is discussed from the information science point of view. The course also introduces scientific work and its sub-processes through listening, discussing, reading, critical and creative thinking, material search, structuring and writing papers.
Mode of delivery:
Blended teaching
Learning activities and teaching methods:
Lectures (24 h), exercise work (40 h), and self-study (71 h). The course uses a web-based learning environment for sharing information and exercises in support of reading.
Target group:

Recommended optional programme components:

Recommended or required reading:
Will be announced during the course.
Assessment methods and criteria:

Will be announced during the course.
Grading:
1 - 5
Person responsible:
Juhani Warsta

811169P: Introduction to Information Systems Design, 6 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Rajanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811169P Introduction to Information Systems Design (OPEN UNI) 6.0 op

811170P Introduction to Information Systems Analysis and Design 6.0 op

811170P-02 Introduction to Information Systems Analysis and Design, exam 0.0 op

811170P-01 Introduction to Information Systems Analysis and Design, exercise work 0.0 op

ECTS Credits:
6 ECTS credits/160 hours of work
Language of instruction:
Finnish
Timing:
1 st year of Bachelor studies, period 4.
Learning outcomes:
After completing the course, the student will be able to:

- Explain the main areas of the information system design on technical level, main design process models for the information system design, basics of the requirement gathering, basics of the information system initialization, and basics of how to evaluate information systems.;
- Produce use-case descriptions, use-case diagrams and other types of diagrams and descriptions needed to model the operational environment of the information system

Contents:
Basic concepts of Information Systems, Information System Design, Information System Modeling, Operational Environment Modeling, Process models for Information System Development, Evaluation of Information Systems.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures (9x3h), Exercises (7x3h), Assignment (109h), Exam (3h).
Target group:

Recommended optional programme components:

Recommended or required reading:
Structure and contents of the course are based on:

- Satzinger, Jackson ja Burd (2007), Systems Analysis and Design in a Changing World
- Hoffer, George and Valacich (2008), Modern systems Analysis and Design, 5. revision

Assessment methods and criteria:
Exam and mandatory assignment.

Grading:
1–5
Person responsible:
Mikko Rajanen
Working life cooperation:
No

811192P: Introduction to Programming in C, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Räsänen

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
Finnish
Timing:
1st year, autumn semester, period 2+3

Learning outcomes:
After completing the course the student is able to design a programme by splitting main problem into solvable sub problems. The outcome of design process is modules which she/he is able to write by using chosen programming

language. Student is able to use selection and loop structures to control execution of a module and control execution between modules. Student is able to use basic data types for saving and processing data and she/he is able to use right operations to this data. Student is able to use arrays to handle large amounts of same type of data and is able to use control structures to flexibly manipulate the data of arrays. Student is able to use pointers for example to enhance passing large amount of data between modules and at the same time taking care of the risks of using pointers. Student is able to use structured data types that contain fields of different data types and is able to manipulate the fields of these data structures. Student is able to programmatically use files to save permanently large amount of data she/he is able programmatically read data from files for further processing.

Contents:

1. Software design method (waterfall)
2. Problem solving
3. Stepwise refinement
4. Control structures
5. Modular programming, calling modules, communication between modules
6. Data types
7. Arrays
8. Pointers
9. Character strings
10. Data structures
11. File processing

Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures 40h, exercises 24h, self-study 70h.
Recommended or required reading:
Deitel, Deitel: C HOW TO PROGRAM; Pearson Education Inc. 2007
Assessment methods and criteria:
1. Final exam and exercise points; and 2. Weekly exams and exercise points.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Ilkka Räsänen
Working life cooperation:
No

811174P: Introduction to Software Business, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Marianne Kinnula

Opintokohteen kielet: Finnish

Leikkaavuudet:

811178P	Technology Business and Innovations	5.0 op
ay811174P	Introduction to Software Business (OPEN UNI)	5.0 op

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
Finnish
Timing:
1st year, spring semester, period 4

Learning outcomes:
After completing the course, a student can:

- Explain how the industry is structured;

- Describe the software industry's business logic as typically used in business models and the reasoning behind their use;
- Describe the important areas of the software business.

Contents:
This course provides an overview of software business from three different viewpoints: software industry, business logic, and functions of a software company. The course topics include history of software business, structuring and clusters of software industry, business models in software industry, networking and outsourcing, growth and development of a software company, software marketing and sales, and internalization of a software company.
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures (24-28h), exercises (20h), independent work (60-64h), take home examination (20h)
Target group:

Recommended optional programme components:
-
Recommended or required reading:
E. Hyvönen (toim.): Ohjelmistoliiketoiminta
Assessment methods and criteria:
Assignments, take home examination.
Grading:
1 - 5
Person responsible:
Marianne Kinnula

811176P: Programming Assignment, 2 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Räsänen

Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credits/54 hours of work
Language of instruction:
Finnish
Timing:
1st year, autumn semester, period 3 + 4
Learning outcomes:
After completing the course, the student can systematically design, implement and test simple programs using C-language as a target language.
Contents:

- Problem analysis
- Design
- Implementation
- Documentation

Mode of delivery:
Face-to-face and web-based teaching
Learning activities and teaching methods:
Independent work 50h, 2 workshop 4h and web tutoring
Target group:

Prerequisites and co-requisites:
811192P “Introduction to Programming in C”

Recommended optional programme components:

Recommended or required reading:
Introduction to programming lecture material
Assessment methods and criteria:
Accomplish programming assignment
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Ilkka Räsänen

811383A: Bachelor Thesis, 7 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
7 ECTS credits/187 hours of work

Language of instruction:

Timing:
3rd year, timing is free
Learning outcomes:
After completing the course, a student is able to:

- Produce their own research work, stage a concrete plan and refine it as the work progresses;
- Find the source materials as well as the library electronic databases;
- Analyse scientific texts and make them a source of criticism;
- Produce well-structured scientific text;
- Identify their work against future problems;
- Ask for advice and the counsellor will use the guidance in favour of work-testing plan.

Contents:
Each student will be guided based on the research literature.
Mode of delivery:
Guided self-motivated work
Learning activities and teaching methods:
Students prepare calendars of work as part of the research plan. The student has personal meetings with the supervisor or instructor to discuss topic selection and scoping, the research plan, the final review of the literature and a thesis draft. The director, depending on the thesis, may also be associated with other students via meetings for interaction.
Target group:
Bachelor level students.
Prerequisites and co-requisites:
Compulsory basic studies in the major subject (about 60 credits) completed, in particular an introduction to research work-study modules to prepare the thesis for BSc. During the course or immediately after, the course is part of the pre-Master’s thesis. Written final test conducted on the research topic.

Recommended optional programme components:

Recommended or required reading:
The student's self-written material, institution and the instructor advice and scientific research and support material. Written work must be in compliance with the institution's formal guidelines.

Assessment methods and criteria:

Course requires a Bachelor's thesis preparation. In addition, the course may be included in the pilot, as determined by scientific research-related tasks.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Approved / failed
Person responsible:
Raija Halonen
Working life cooperation:
No

811380A: Basics of Databases, 7 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

ECTS Credits:
7 ECTS credits/159 hours of work

Language of instruction:
Finnish. One English exercises group will be organized if at least four students need it.
Timing:
2 nd year, autumn semester, period 2, and spring semester, period 3
Learning outcomes:
After completing the course, students understand what databases are and what their meaning for information systems is. They can model conceptually for database designing purposes, design a high-quality relational database and make queries to it. They have constructed a small database application. They are able to throw simple XML-database with XML Schema definitions, and they know how to use an object-relational database in an object-oriented programme. They understand transactions, schedules of transactions, serialiseability of schedules and recovery choices of schedules. They also know what different SQL Isolation levels means to safety of transactions.

Contents:
Conceptual modelling (ER- and EER-diagrams), relational model (theory, databases, query techniques and normalization), XML-databases, object-relational databases, transactions.

Mode of delivery:
Face-to-face

Learning activities and teaching methods:
Lectures 45h, compulsory exercises 24h and (reading 20h) and assignments 27h. Exams 21h. Self-studying 52h.

Target group:

Prerequisites and co-requisites:
The student knows basics of programming.
Recommended optional programme components:

Recommended or required reading:
Silberschatz, Korth & Sudarshan: Database system concepts. Elmasri & Navathe: Fundamentald of database systems.
Assessment methods and criteria:
The course is divided to six parts. All parts must be passed in a year. Students must show they achieve at least half of required knowledge of each part.

Grading:
1-5
Person responsible:
Juha Iisakka
Working life cooperation:
No

811379A: Basics of Human Computer Interaction, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Eeva Leinonen, Anna-Liisa Syrjänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811379A	Basics of Human Computer Interaction (OPEN UNI)	5.0 op
812327A	Introduction to HCI design	4.0 op

ECTS Credits:
5 ECTS credits/135 hours of work
Language of instruction:
Finnish
Timing:
2 nd year, spring semester, period 4
Learning outcomes:
After completing the course, a student is able to define the basic concepts of user interface design, introduce the basic design process and its steps, the most common design and evaluation methods and tasks, and apply them in the context of graphic user interface design.
Contents:
The terminology and fundamental concepts of the area, user interface, usability, interaction model and context, elements and navigation related to common windowed systems, basics of interaction design process, common usability and design rules, evaluation techniques, universal design and user support.
Mode of delivery:
Face-to-face teaching, self-study
Learning activities and teaching methods:
Lectures 20h, assignments or one larger assignment and presentation 68h, exam 47 h.
Target group:

Prerequisites and co-requisites:
Course “Humans as Users and Developers of Information Technology” (811171P) or similar knowledge.
Recommended optional programme components:

Recommended or required reading:
Dix et al. (2004, 3rd edition or later edition) Human-Computer Interaction and lecture and assignment materials.
Assessment methods and criteria:
Assignments/assignment and presentation, exam.

Grading:
Assignment pass/fail, exam 1–5
Person responsible:
Anna-Liisa Syrjänen, itsenäinen tapa
Eeva Leinonen, luennot 2015
Working life cooperation:
No

811147A: Basics of Statistical Data Analysis for Information Processing Science, 4 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Markkula

Opintokohteen kielet: Finnish

ECTS Credits:
4 ECTS credits/108 hours of work.
Language of instruction:
Finnish
Timing:
The course is held in the spring semester, during period 3. It is recommended to complete the course in the final phase of bachelor studies.

Learning outcomes:

After completion of the course, the student can identify and describe the basic properties and types of statistical data and is able to apply them in information processing sciences, information systems and software engineering. The student is able to specify metrics and handle statistical variables. She or he is also able to describe, present and analyse descriptive statistical data sets.
Contents:
Types of statistical data, data collection methods, measurement and variables, sampling, management of statistical data, descriptive statistics, graphical presentation of data, basics of data analysis.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20h, exercises 20h, independent work 68h
Target group:

Recommended optional programme components:
-
Recommended or required reading:
Lecture slides, given literature and exercise tasks.
Literature:
- Blaikie, Norman (2003), Analyzing Quantitative Data (section 1-5)
- Other examples from: Wild & Seber (2000), Chance Encounters; Antony (2008), Design of Experiments for Engineers and Scientists; George, Rowlands, Proce, Maxey (2005), Lean Six Sigma Pocket Toolbook

Assessment methods and criteria:
The course is evaluated based on passed exam and acceptable exercise tasks.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Jouni Markkula
Working life cooperation:
No

813316A: Business Process Modeling, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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:
Jukka Kontula
Working life cooperation:
No

811312A: Data Structures and Algorithms, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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/134 hours of work

Language of instruction:
Finnish
Timing:
2nd year, autumn semester, period 2

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 40h, exercises 24h, independent work 70h.
Target group:

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
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Ari Vesanen
Working life cooperation:
No

812304A: Information Systems in Organizations, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Juhani Warsta, Seppo Pahnila

Opintokohteen kielet: Finnish

ECTS Credits:

6 ECTS credits / 160 hours of work.
Language of instruction:
Finnish
Timing:
1 st year of Bachelor level studies, fall semester, periods 1-2.

Learning outcomes:
After completing the course, the student

- Can explain the importance of information systems in organizations
- Can define the conditions for the successful operation of the information in the organization
- Can explain the main features of the development of information systems

Contents:
The basics issues of organization, structure, and operation, the basics of a digital organization, information types and roles of the organizations, interaction between information and organization, the role of information systems in the management of organizations and decision-making, formation of organizational knowledge and management, enterprise resource planning (ERP) systems, organizational reform of information systems and the economic importance of information systems.

Mode of delivery:
Face-to-face lectures. Individual lecture assignments. Each student write at minimum eight so called week essays of ten. Lectures and the subject of each essay are available in Optima learning environment. Students upload the essays into Optima.

Learning activities and teaching methods:
Lectures (20h). Independent study of the course literature (136h).
Target group:

Recommended or required reading:
To be announced during the course implementation.

Assessment methods and criteria:
Essays.
Grading:
1-5
Person responsible:
Juhani Warsta ja Seppo Pahnila
Working life cooperation:
No

812334A: Information systems planning, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaisu Juntunen

Opintokohteen kielet: Finnish

ECTS Credits:
6 ECTS credits/160 hours of work

Language of instruction:
Finnish
Timing:
3 rd year, spring semester, periods 3–4
Learning outcomes:
After completing the course students are able to explain connection between the information systems designing and the development of operational activities. Students are able to apply development-oriented information systems design methodology.

Contents:
A practical information systems design exercise is carried out in groups of 3–4 students. The focus is on phases of information systems design preceding software design. Assignment is carried out using a chosen information systems design methodology (currently Contextual Design).

Mode of delivery:

Lectures 24h, exercises 24h, course assignment 90h, seminars 12h, individual learning diaries 10h. Passing the course requires 80% attendance.
Learning activities and teaching methods:
Face to face teaching.
Target group:

Prerequisites and co-requisites:
811169P “Introduction to Information Systems Design” and 812346A “Object Oriented Analysis and Design”.

Recommended optional programme components:

Recommended or required reading:
Beyer, H. Holtzblatt, K. (1998): Contextual Design: Defining Customer-Centred Systems. San Francisco: Morgan Kaufmann Publishers, Inc.

Assessment methods and criteria:
Group assignment and individual learning diary. The assignment is done according to the contextual design method. The exercises support the fulfilment of the assignment. The results of the assignment are presented in seminars, with comments from opponents. Based on the justifiable reasons, the course can be passed via individual work.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Kaisu Juntunen
Working life cooperation:
No

811338A: Internet and Computer Networks, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Kortelainen

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
Finnish
Timing:
1 st year, spring semester, period 3
Learning outcomes:
The student is able to describe the functioning of a computer network and how data is transmitted in a network, to list the distinct layers of a network (in two reference models), to estimate the significance and operation of distinct layers and to compare connectionless and connection-oriented transport. She/he identifies the most important network protocols and is able to estimate their functions. The student is able to explain the structure of the Internet addressing system and the general principles according to which routing in IP-networks is carried out. She/he is able to calculate values to parameters describing the capacity of the network (transmission rate, traffic intensity, delay, etc.) and to apply the theory in a computer class, for instance, when analysing the network traffic.

Contents:
1. The history and development of Internet and WWW;
2. The basic concepts of computer networks: network devices, physical media, circuit switching, packet switching, delay, loss and throughput, protocols layers and refer-ence models;
3. The functioning of the application layer, network application architectures, commu-nicating processes, transport services;
4. Classical network applications: electronic mail, file transfer, remote login, news-groups;

5. New applications on the Internet: DNS, World Wide Web and HTTP, content distri-bution;
6. Data transmission on the Internet. UDP protocol: connectionless and simple. TCP protocol: connection-oriented and reliable data transfer;
7. Addressing and routing on the Internet, IP protocol;
8. Multimedia: real-time applications, streaming stored audio and video, Internet radio, Internet telephone (VoIP), QoS;
9. Local area networks, multiple access protocols, link-layer addressing, network de-vices, wireless connections;
10. The principles of network security, security in different layers of the network.

Mode of delivery:
Face-to-face teaching, or an alternative way to pass the course (Erasmus students, and some specific cases)
Learning activities and teaching methods:
Lectures 36h, exercises 30h, autonomous work about 68h, or Contact Education, or an alternative way to pass the course (Erasmus students, and some specific cases)
Target group:

Recommended optional programme components:

Recommended or required reading:
Lecture slides (about 250 slides), text book: J. F. Kurose and K. W. Ross, Computer Networking. A Top-Down Approach, 5th Edition, Pearson Education Inc., 2010. ISBN: 978-0-136548-3 and any other material presented in lectures

Assessment methods and criteria:
Assessment methods and criteria: The course is completed and approved the final test and exercises or an alternate way to pass the course (Erasmus students, and some specific cases)
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5
Person responsible:
Juha Kortelainen
Working life cooperation:
No

811382A: Introduction to research work, 4 op

Voimassaolo: 01.08.2011 - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Halonen, Raija Helena

Opintokohteen kielet: Finnish

ECTS Credits:
4 ECTS credits/106 hours of work

Language of instruction:
Finnish
Timing:
3rd year of Bachelor studies, periods 1-3.
Learning outcomes:
After completing the course, the student is able to understand the role of research in the society and university, and he or she knows how the study carried out at the department is located in the discipline. The student can name the basic phases of research process and how they are related to each other. The student knows the importance of scientific publishing for the research; identifies different channels for publications; and can use at least two different ways to evaluate quality – the quality of the publication forum and the number of citations. The student understands scientific argumentation and its role in research; knows the parts of an argument; and can analyse simple arguments. The student knows the role of empirical material in research and knows some key means to collect and analyse research material. The student knows why certain methods are chosen.
The student is able to seek articles from databases and use searches.

Contents:
Research in general, scientific publishing, scientific argumentation, collecting and analyzing empirical material, information search.
Mode of delivery:
Face-to-face teaching.

Learning activities and teaching methods:
Lectures 18 h, exercises 36h, independent work 52 h.
Target group:

Recommended or required reading:
Lecture material and exercise material.

Assessment methods and criteria:
Participation in lectures and exercises, and a written exercise.
Grading:
1–5

Person responsible:
Raija Halonen
Working life cooperation:
No

812346A: Object Oriented Analysis and Design, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
6 ECTS credits/160 hours of work

Language of instruction:
Finnish. If at least four non-Finnish student take the course, English exercises group is organised.

Timing:
2nd year, autum semester, period 1

Learning outcomes:
After completing the course, the students know possibilities of UML-language family to describe different views. They can picture a task using Use cases and scenarios. Moreover they can produce detailed descriptions using activity-, class-, interaction- and state diagrams. They know principles of object-orientedness and can use abstract as well interface classes. Additionally they can model user interface by state diagrams. They understand what design patterns are and how they are described and categorised.
Contents:
Principles of object orientation and object-oriented programming; quality criteria of object orientation; design patterns; case use; activity, class, interaction and state machine diagrams; class realisation.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30h, compulsory exercises and assignments 28h, independent work 102h.
Prerequisites and co-requisites:
Basic knowledge of programming and information systems analysis and design.
Recommended optional programme components:
We recommend to take also the course Object-oriented programming (812347A).
Recommended or required reading:
Bennet, McRobb & Farmer: Object-oriented systems analysis and design, Using UML
Assessment methods and criteria:

Examination. At least 50% on points needed for passing the course.

Grading:
1-5
Person responsible:
Juha Iisakka
Working life cooperation:
No

812347A: Object-Oriented Programming, 6 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Ari Vesanen

Opintokohteen kielet: Finnish

ECTS Credits:
6 ECTS credits/160 hours of work

Language of instruction:
Finnish
Timing:
2nd year, autumn semester, period 1

Learning outcomes:
After completing the course, the student is able to explain the general objectives and techniques of object-oriented programming paradigm. Furthermore, the student can describe the practical meaning of concepts of object-oriented programming. The student can construct C++ programs that apply inheritance, composition and polymorphism. Finally, the student is able to describe most common design patterns and to design and construct programs that contain the design patterns presented in the course.

Contents:
Introduction to object-orientation, basics of programming in C++ language, composition, inheritance and polymorphism, design patterns, generics, C++ standard template library and containers.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 32h, laboratory exercises 21h, weekly assignments and independent work 107h
Target group:

Prerequisites and co-requisites:
Courses “811192P Introduction to Programming in C”, “811175P Programming Assignment” or similar knowledge.
Recommended optional programme components:

Recommended or required reading:
- Timothy Budd: Introduction to object-oriented programming, 3rd edition.
- Erich Gamma, Richard Helm, Ralph Johnson & John Vlissides: Design patterns – Elements of reusable object-oriented software.
- Bruce Eckel: Thinking in C++ Volume 1, 2nd edition.

Assessment methods and criteria:
Weekly assignments (preferred) or final exam + programming assignment
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:

Ari Vesanen
Working life cooperation:
No

811365A: Project I, 7 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Siirtola

Opintokohteen kielet: Finnish

Leikkaavuudet:

811366A Project Work 10.0 op

ECTS Credits:
7 ECTS credits/201hours of work

Language of instruction:
Finnish
Timing:
3 rd year, autumn and spring semester, periods 2–4

Learning outcomes:
After completing the course, the student:

- Can apply the theory of working in a project and project management into practice;
- Can function as a member of a project team;
- Can communicate appropriately with the stakeholders of the project by using both written and spoken language;
- Can apply the experience gained from the design, implementation and testing of the delivered solution for future software and/or research projects.

Contents:
The course contains practical work in a project commissioned by a software company or an academic research project. Within the topics of project development, the following are dealt with during the course: the project as a way of working, project planning, project implementation and ending the project.

Mode of delivery:
Face-to-face (project teaching)

Learning activities and teaching methods:
Lectures 1h, project work 200h.

Target group:

Prerequisites and co-requisites:
“Project Management Principles” (811311A). Also check the prerequisites for working within a project from the prerequisites of the aforementioned course description.
Recommended optional programme components:

Recommended or required reading:
Material from the previous project courses, in addition a project manual within the course www-space.

Assessment methods and criteria:
Assessment methods: The student must work toward the completion of the project tasks for the required amount of time.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
pass / fail

Person responsible:
Antti Siirtola
Working life cooperation:
Yes, the students work with the topics ordered by customer organisations, while simulating as authentically as possible the software development within a real working environment.

811311A: Project Management Principles, 3 op

Voimassaolo: 01.01.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Tonja Molin-Juustila

Opintokohteen kielet: Finnish

Leikkaavuudet:

811366A Project Work 10.0 op

ECTS Credits:
3 ECTS credits/80 hours of work
Language of instruction:
Finnish
Timing:
3 rd year, autumn semester, period 1

Learning outcomes:
After completing the course the student understands and can explain central concepts, methods, and capabilities of various necessary roles in software projects of moderate size and assurance. The student understands and can explain typical software project risks, knows how to prepare for them, how to collect the necessary data and how to take critical project decisions from the project outset to completion.

Contents:
Project and project team organisation; project roles and tasks; decision making; software project operation definition and evaluation. Plan-driven and agile software development. Software project management, planning, scope management and schedule; change management; quality and risk management; project planning, tracking, reporting and review. The project manager’s leadership capabilities.
Mode of delivery:
Face-to-face teaching and workshops
Learning activities and teaching methods:
Lectures, lecture assignments and workshops about 80h.
Prerequisites and co-requisites:
Compulsory prerequisites are the following courses: Introduction to Programming in C (811192P) and Programming Assignment (811176P), Object-Oriented Programming, either weekly assignments or exercises work completed (812347A), Data Structures and Algorithms (811312A), Introduction to Information Systems Design (811169P), Basics of Databases (811380A) and programming assignment and Software Engineering (811335A). The above courses also serve as a compulsory forerunner to a course Project 1 (811365A). Prerequisites do not apply to those students who have already completed a Bachelor's degree or higher degree, or other equivalent degree.
Recommended or required reading:
Lecture slides, R. Pressman, Software Engineering: A Practitioner's Approach. McGraw-Hill, 2005 and any other material presented in lectures.
Assessment methods and criteria:
Lectures and workshops, including workshop reports.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail
Person responsible:
Tonja Molin-Juustila

Working life cooperation:
No

811391A: Requirements Engineering, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Saukkonen, Samuli

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay811391A Requirements Engineering (OPEN UNI) 5.0 op

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
Finnish
Timing:
3 rd year, autumn semester, period 2
Learning outcomes:
After completing this course, the student can analyse the requirements from the problem-domain and solution-domain viewpoints, and understands the special issues associated with these viewpoints. The student can distinguish the roles of problem-domain and solution-domain requirements for the customer and developer; he/she is able to identify various project types and knows which requirement style fits best to each project type. The student will be familiar with various requirement definition styles together with their pros and cons, and is able to use some of the most important definition styles. Several requirements of elicitation techniques will be added to the student's toolbox with the skills of mastering some of them. The principles of requirements management, validation and verification during the product life cycle will be familiar to the student at the end of this course.

Contents:
Concepts of problem and solution domain. Requirements in different use contexts. Description styles for functional and non-functional requirements. Validation and verification of requirements. Requirements negotiation and prioritisation. Release planning. Requirements management during the product life cycle.

Mode of delivery:
The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:
Lectures 32h, weekly assignments and project assignment about 102h.
Target group:

Prerequisites and co-requisites:
We assume the basic skills from the following courses: "811169P Introduction to Information System Design", "812346A Object-Oriented Analysis and Design", "811380A Basics of Databases", "811335A Software Engineering" and "812334A Information Systems Planning".
Recommended optional programme components:

Recommended or required reading:
S. Lauesen, Software Requirements – Styles and Techniques. Pearson Education 2002; chapters 1–4 and 6–9. A.M. Davis, Just Enough Requirements Management, Dorset House Publishing 2005; parts. Lecture slides.

Assessment methods and criteria:
Two ways of passing:
1) Active participation: weekly assignments and project assignment (only for Finnish-speaking students)
2) Conventional exam
Read more about assessment criteria at the University of Oulu webpage.
Grading:

Active participation will be evaluated based on the weekly assignments and the project work; the scale will be 1–5. The exam will be evaluated on a scale of 1–5.

Person responsible:
Samuli Saukkonen
Working life cooperation:
No

815347A: Software architectures, 6 op

Voimassaolo: - 31.07.2016

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Siirtola

Opintokohteen kielet: Finnish

ECTS Credits:
6 ECTS credits/160 hours of student work.

Language of instruction:
Finnish
Timing:
3rd study year (BSc program), periods 3-4 (January-May), compulsory.
Learning outcomes:

The course gives the students an overall view on the concepts and techniques of software architectures. The focus is on object oriented systems, but the course also discusses architectural models and techniques that are generic. After the course, a student is able to identify and analyze different software architecture solutions and understands the pros and cons of these from the viewpoints of software construction, execution, quality and maintenance. The student is able to describe the architectural solutions, elements of these, as well as the interfaces in between elements using UML. The student is able to create alternative architectural solutions based on functional and non-functional requirements, using different architectural design methods and techniques. Furthermore, the student is able to evaluate the fit for use of the different alternatives. The student is able to distinguish the differences between the design of product architecture and product line architecture in comparison to conventional software architectures.

Contents:

The fundamentals of software architectures. Documenting software architecures. Components and interfaces. Dependencies in software. Design patterns. Architectural styles. Product line architectures. Frameworks. Evaluating software architectures.

Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures (30 h), exercises (20 h), exercise work (90 h) and examination (20 h).

Target group:

Prerequisites and co-requisites:
The required knowledge to participate the course includes the basics of software development process and basics of object oriented modeling with UMLThese are treated in courses 811335A Software engineering, 812346A Object Oriented Analysis and Design. Also, basic skills in object oriented programming (with C++ or Java) is recommended.
Recommended optional programme components:

Recommended or required reading:
- Robert Hanmer: Pattern-Oriented Software Architecture For Dummies, 2013
- K. Koskimies, T. Mikkonen: Ohjelmistoarkkitehtuurit. Talentum 2005;
- L. Bass, R. Clements, R. Kazman: Software Architecture in Practice. Addison-Wesley 2003;
- Other material announced **.**

Assessment methods and criteria:
Lectures are not compulsory but highly recommended. Other parts are compulsory and are evaluated. Criteria for passing: 40% of exercises done; exercise work: accepted performance; examination: 12/24 points.
Grading:
Fail, 1-5
Person responsible:
Antti Siirtola
Working life cooperation:
No

811335A: Software engineering, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Lappalainen, Jouni Esko Antero

Opintokohteen kielet: Finnish

ECTS Credits:
6 ECTS credits/160 hours of work

Language of instruction:
Finnish
Timing:
2 nd year, spring semester, period 3
Learning outcomes:
After completing the course, a student is able to explain various aspects of software engineering areas such as process models, requirement specification, analysis and design methods, quality management and project management, their importance and know how to use them for small-scale task solving. A student is familiar with software engineering practices and activities (review, testing, software product management, risk management, project management) and knows how to use them in software development at different levels. A student can explain the maintenance and redesign of software evolution and its importance.
Contents:
Software process, software requirements, software design methods, software engineering practices, software quality management, software project management
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Implementation methods of the course vary: a) Lectures 32h, exercises 24h, study group working 40h, assignment 40h and self-study 24h; b) Lectures 32h, exercises 24h, exam 64h, assignment 40h; c) Lectures 32h, exercises 24h, essay 64h, assignment 40h.
Prerequisites and co-requisites:
Course “811169P Introduction to Information Systems Design” and “812346A Object Oriented Analysis and Design” or similar knowledge.

Recommended optional programme components:

Recommended or required reading:
Pressman R., Software Engineering, A Practitioner’s Approach, 7 th edition, McGraw-Hill, 2010, lecture material
Assessment methods and criteria:
Exam and assignment, exam can be replaced by study group work or essay.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Jouni Lappalainen
Working life cooperation:
No

811375A: User Interface Programming, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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.

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.
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

813613S: Master's Thesis, 30 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
30 ECTS credits/800 hours of work.

Language of instruction:
Finnish/English.

Timing:
Timing is free; execution can be allocated over several semesters. Obligatory for Master's degree. During 1st and 2nd year of Master's studies.
Learning outcomes:
After completing the thesis the student can:

- Define a relevant focused problem in the field of information processing science;
- Apply a scientific method as a tool in solving the stated research problem;
- Synthesise research results and evaluate their validity;
- Write a scientific thesis based on the accomplished research according to the de-partment's guidelines;
- Participate in the evolution of ICT and postgraduate studies after completing the thesis.

Mode of delivery:
Face-to-face meetings and electronic communication with the supervisor.

Learning activities and teaching methods:
Conducting and reporting research under supervision of personal advisor.
Prerequisites and co-requisites:
The research plan and the final draft of the thesis will be presented in the "Master's Thesis Seminar" (813602S).

Assessment methods and criteria:
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The supervisor and a second independent reviewer will evaluate the thesis using the scale 1–5.
Person responsible:
Kari Kuutti, Ilkka Tervonen

Working life cooperation:
Especially empirical Master's theses are often done in cooperation with private or public sector.

813602S: Master's thesis seminar, 2 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Pahnila, Similä, Jouni Kalervo

Opintokohteen kielet: Finnish

Required proficiency level:

ECTS Credits:
2 ECTS credits/54 hours of work.

Language of instruction:
Finnish / English
Timing:
1st – 2nd year of Master's studies, autumn and spring semesters, periods 1–4.

Learning outcomes:
By completing this course the student can plan scientific study, is capable of presenting own research plan and final draft of own Master's thesis, and understands the approach the reviewers use to evaluate a thesis.

Contents:

See “assessment methods” below
Mode of delivery:
Mainly face-to-face seminar meetings, if needed telecom meetings are possible.
Learning activities and teaching methods:
Planning and presenting the student’s own research. Listening to peers’ research plans and research reports.

Target group:

Prerequisites and co-requisites:
“813613S Master’s thesis” course
Recommended optional programme components:

Recommended or required reading:
Guidelines to producing a Master’s thesis.
Assessment methods and criteria:
Active participation in at least seven seminar sessions. One session lasts about 2 hours and they are arranged during the semesters according to the plan published on the website. The students will present their own research plan and the research before official evaluation. During the presentation the research will be discussed critically by an opponent.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail

Person responsible:
Jouni Similä, Seppo Pahnila
Working life cooperation:
No
Other information:

817606S: Project II (Project in Distributed Global Context), 11 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Tonja Molin-Juustila

Opintokohteen kielet: English

ECTS Credits:
11 ECTS credits/300 hours of work
Language of instruction:
English
Timing:
1 st year of Master’s studies for two periods: spring semester, periods 3 & 4 (recommended). Or 2 nd year, autumn semester, periods 1 & 2.
Learning outcomes:
After completing the course, the students should demonstrate their abilities to work on a challenging ICT project. Students will learn to acquire and apply academic expertise in the topic of the project. Students will also demonstrate their skills to conduct an ICT project in a professional way. By completing this course, students are able to act as independent professional members of an ICT project and have advanced professionalism in project work and management.

As a professional conducting a project in a managed way, the student is able to
- Plan the project (with limited resources);
- Search research articles and other up to date information on the topic of the project (review) and apply this in the project work;
- Manage the progress of the project with the steering group/project team organization (reporting the progress and results of the project, the use of the steering group in decision making and problem resolution);

- Follow the progress of the project in real time within the project team (weekly/daily meetings);
- Work as responsible project team member;
- Produce realistic outcome in relation to the project resources (ok, good, excellent);
- Articulate experience and learning related to the topic of the project.

Contents:
Starting lecture, where the steps of carrying out the course will be described together with the potential project assignments. Allocation of the project teams will immediately follow the starting lecture. The project work will take two periods (one semester).
Mode of delivery:
Face-to-face teaching at the beginning together with web-based learning environment, mainly project work as collaborative team work, each project group supported with a private supervisor.
Learning activities and teaching methods:
Project work 300h per student. Working hours reported during the project. Attendance at the starting lecture is mandatory.
Target group:
Master's level students.
Prerequisites and co-requisites:
Mandatory: B.Sc. degree or other equivalent degree. Students enrolling directly to the Master's programme should take the "Project Management Principles (811311A)" course first (see the timetable for the autumn semester, 3 rd year of B.Sc. studies, period 1) or otherwise master the basics of project work and management as in Pressman, R. S. *Software Engineering: A Practitioner's Approach*, the chapters related to project management. The expertise gained during this project course will be further elaborated during the "Project II Seminar (817609S)" course, which will immediately follow this course during the next period (1 for spring projects or 3 for autumn projects).
Recommended or required reading:
Unique project material provided by the customer of the project and/or material to be collected and studied by the project team.
Assessment methods and criteria:
Professional project management skills will be reported by a project portfolio. Assessment criteria will be given at the starting lecture and they will also be available in the web-based learning environment.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Every member of the project team will get the same grade (scale 1-5).

Person responsible:
Tonja Molin-Juustila
Working life cooperation:
Yes. Learning by doing, i.e. managing authentic, resource-limited project work and integrating the practices of an academic expert into the unique project assignment.

817609S: Project Seminar, 3 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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 "Project II (817606S)" course and will immediately follow Project II in the next semester.
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 ("Project II" 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: Project II (817606S) during the previous two periods. This course will immediately follow the project course on the project topics.
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 project course (Project II, 817606S).
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 (seminar paper) and 25% on the oral presentation.

Person responsible:
Tonja Molin-Juustila
Working life cooperation:
No

813621S: Research Methods, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

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

815308A: Embedded Software Development Environments, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Henrik Hedberg

Opintokohteen kielet: English

Leikkaavuudet:

811359A	Mobile Systems Programming	6.0 op
811359A-01	Programming mobile devices, exercise work	0.0 op
811359A-02	Programming mobile devices, exam	0.0 op

ECTS Credits:
4 ECTS credits/108 hours of work

Language of instruction:

English
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 40h, exercise work 68h

Target group:

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 optional programme components:

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:
Henrik Hedberg
Working life cooperation:
No

815653S: Open Source Software Development, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Henrik Hedberg

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work

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

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

- Define the historical background and the ideology of OSS;

- Participate in an OSS development project;
- Evaluate the impact of using OSS and OSS licenses in software development and exploitation;
- View the phenomenon through essential scientific research.

Contents:
Open Source Software (OSS) is one of the most topical phenomena in software development. It affects both software production and the decisions of user organisations. OSS can be studied from different social, legal, economical, software engineering and data security viewpoints. The course covers the range of scientific findings on the OSS paradigm. The course introduces the Open Source Software (OSS) development paradigm and current topics in OSS research. The aim is to study from different viewpoints, 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 is on research work.
Mode of delivery:
Mostly face-to-face teaching but some parts are implemented as distance teaching
Learning activities and teaching methods:
Lectures and seminars about 40h, exercises about 10h, seminar paper about 58h.
Prerequisites and co-requisites:
Compulsory prerequisites are bachelor degree or other equivalent degree and basic knowledge of software engineering and research work. The course allows passing Project II following the OSS development principles or a Master's thesis on an OSS topic.
Recommended optional programme components:

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; international articles covering the topic.
Assessment methods and criteria:
Active participation and a seminar paper
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Henrik Hedberg
Working life cooperation:
No

815309A: Real Time Distributed Software Development, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Pulli

Opintokohteen kielet: English

ECTS Credits:
6 ECTS credits/160 hours of work
Language of instruction:
English
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. Multitasking, interrupts;
8. Hardware interfaces.

Characteristics of Distribution
1. Centralised;
2. Client-server;
3. Clusters ;
4. Cloud;
5. Peer-to-peer;
6. Ad hoc;
7. Concept of time;
8. Synchronisation;
9. Latency and jitter;
10. Quality of service;
11. Service discovery;
12. Networking primitives;
13. Networking platforms.

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 45h, design exercises 15h, student projects 100h.
Target group:

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

Recommended or required reading:
Lecture notes based on reference books
- Douglass B.P. (2007) Real-Time UML – Advances in the UML for Real-Time Sys-tems. Third edition. Addison-Wesley ISBN 0-321-16076-2. 694 p.
- 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.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Petri Pulli
Working life cooperation:
No

817602S: Software Development in Global Environment, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Similä, Jouni Kalervo

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/135 hours of work.

Language of instruction:
English
Timing:

1 st year of Master's studies, fall semester.
Learning outcomes:
After completing the course, the student

- Can define the key success factors of Global Software Design (GSD) and the potential problems in coordination of projects where teams are separated by physical and/or temporal distance;
- Can define and evaluate the collaborative technologies, which in the best way support distributed software development;
- Can choose the methods and tools for distributed software development;
- Can apply the practices of GSD in a student project and use the supporting tools throughout the project life cycle.

Contents:
Some of the topics covered are strategic issues in distributed development (off-shoring, near-shoring, outsourcing, OSS); cost-benefit-risk analysis; the triad of coordination, control and communication; team building (e.g. virtual teams); software process paradigms in the global environment (planned, agile); methods and tools for distributed software development; issues related to allocation of tasks; communication issues that arise due to distance and time zone differences; infrastructure support; geographical dispersion; lack of information communication; coordination complexity; cultural issues; technical issues related to information and artefact sharing; architectural design; and finally knowledge management issues. The lectures and seminars also review current research aspects of the GSD and related case studies from industry. The exercises demonstrate distributed software development as a virtual team with the support of appropriate methods and tools.

Mode of delivery:
Face-to-face lectures and seminars with all the students. Lecture assignments: reading articles and writing analyses. Communication between exercise groups of 4 students is done over the internet.

Learning activities and teaching methods:
Lectures and seminars involving all the students as well as lecture assignments (reading articles and writing analyses) 70h (20h lecture attendances, 30h lecture assignments, 20h additional reading), and exercises 65h. For lecture assignments each student will read, summarize and analyse selected academic articles. The exercises include laboratory demonstrations of different supporting tools for distributed software development. The students train in project software development and planning practices in a distributed environment. The student project groups are organised into virtual (distributed) teams of 4 students.
Target group:
Obligatory course for students majoring in Software Engineering and GS3D.

Recommended or required reading:
To be announced during the course implementation.
Assessment methods and criteria:
By active participation or alternatively exam, based on the course study materials.

Grading:
1–5, active participation: lectures (25%), lecture assignments (25%), exercises (50%).

Person responsible:
Jouni Similä
Working life cooperation:
No

Other information:
Participation: The course is obligatory for GS ^{3}D students and software engineering students; the total number of students is limited according to the departmental selection rule (valintasääntö, kts. Opinto-opas). 80% attendance is required. Web page **:** http://www.tol.oulu.fi/index.php?id=1125

815660S: Software Engineering Management, Measurement and Improvement, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Maria Rodriguez

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work

Language of instruction:
English
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.
Learning activities and teaching methods:
Lectures 18h, study group working 25h, paper reading 25h, seminar 20h, report writing 20h
Target group:

Prerequisites and co-requisites:
B.Sc. or other equivalent degree and basic knowledge of software engineering
Recommended optional programme components:

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

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Pilar Rodriguez
Working life cooperation:
No

815661S: Software Engineering Research, 7 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Burak Turhan

Opintokohteen kielet: English

ECTS Credits:
7 ECTS credits/187 hours of work

Language of instruction:
English
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:
Research areas in software engineering, research methods.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures, assignments related to lectures, presentations, report. Lectures and seminars 42h, assignments 105h, report 40h.
Target group:

Prerequisites and co-requisites:
B.Sc. or other equivalent degree
Recommended optional programme components:

Recommended or required reading:
Wohlin C., Runeson P., Höst M., Ohlsson M., Regnell B., Wesslen A., Experimentation in Software Engineering, Kluwer Academic Publishers, 2000, lecture material, software engineering scientific literature.

Assessment methods and criteria:
Assignments related to lectures, report. There is no final exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Burak Turhan
Working life cooperation:

No
Other information:
Course material can be found at Optima.

815310A: Software Production and Maintenance, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Saukkonen, Samuli

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 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:

- 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, 88h.
Target group:

Prerequisites and co-requisites:
Basic knowledge of software engineering and software architectures.

Recommended optional programme components:

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.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Samuli Saukkonen
Working life cooperation:
No

815311A: Software Quality and Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

813619S: Emerging Technologies and Issues, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Oinas-Kukkonen, Harri Ilmari

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 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:
24h lectures, 84h independent work.

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.

Assessment methods and criteria:
Exam (only in English)

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No
Other information:
All questions regarding the course should be directed to Salman Mian (salman.mian@oulu.fi).

812350A: Enterprise Systems, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Li Zhao

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work
Language of instruction:
English
Timing:
1st year of Master's and GS3D studies, spring semester, period 4

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.

Learning activities and teaching methods:
The overall workload for each student in this course is 108 hours. Lectures (24h), exercises (14h), homework (15h), essay (25 h), examination (30h).

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

817604S: ICT and Organizational Change, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Öörni

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
2nd year, spring semester, periods 2+3
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:

Anssi Öörni
Working life cooperation:
No

812349A: IT Infrastructure, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Öörni

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
English
Timing:
1st year of Master's studies, spring semester, period 1

Learning outcomes:
After completing the course, students are able to judge, compare and apply data communications concepts to various situations encountered in industry; identify general concepts and techniques of data communications; explain the technology of the Internet; identify the most important server and storage architectures and the main mechanisms for providing high-capacity processing and storage capacity; and explain the regulatory environ-ment.
Contents:
1. Introduction to large-scale computing applications;
2. Network requirements and architecture;
3. Standards and standards bodies;
4. Network services and Middleware;
5. Internet services, protocols and technologies;
6. Underlying network technologies;
7. Performance monitoring, fault detection, recovery and restoration;
8. Next-generation network infrastructure, industry technology directions.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures (24 h), student project work (90 h) and examination (20 h).
Target group:

Prerequisites and co-requisites:
Student is familiar with basic computer architecture and the Internet.
Recommended optional programme components:

Recommended or required reading:
- Lecture notes;
- Supplementary technical and scientific articles;
- Phil Simon (2010) The next wave of technologies: opportunities from chaos. Wiley. ISBN 0-47-058750-4.

Reference books:
- Comer, D.E. (2009) Computer Networks and Internets. 5th edition. Pearson ISBN 0-13-504583-5. 600 p.
- Kurose J.F., Ross K.W. (2010) Computer Networking – A Top-Down Approach. 5th edition. Pearson ISBN 0-13-136548-7. 888 p.
- Travostino F., Mambretti J., Karmous-Edwards G. (2006) Grid Networks – Enabling grids with advanced communication technology. Wiley ISBN 0-470-01748-1. 340 p.

Assessment methods and criteria:
Individual project work, examination

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Anssi Öörni
Working life cooperation:
No

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

Voimassaolo: 01.08.1950 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: 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 1

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
Working life cooperation:
No

813624S: Information Systems Theory, 7 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
7 ECTS credits/187 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 (40.5h), class preparation 1.5 ECTS (40.5h), and exercises 4 ECTS (107h).

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, active participation in class, class quizzes, research proposal, and research essay are assessed. Note that there is no final exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Tero Vartiainen
Working life cooperation:
No
Other information:
Course material can be found at OPTIMA e-learning environment, Urkund is used for course work submissions.

812335A: Interaction Design, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Netta Iivari, Anna-Liisa Syrjänen

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work
Language of instruction:
English
Timing:
1st year of Master's studies, autumn semester period 2
Learning outcomes:
Objective: The course explains the role of human interaction with products and services, explains the factors and problems related to it to motivate interaction design, and teaches some methods for analysis, evaluation and design of interactions.
Learning Outcomes: After completing the course, the student can assess the role of human interaction with information technological products or 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 for graphical user interface design;
- use interaction design methods to create a novel or redesigned interactive product.

Contents:
The first part provides an overview of interaction design, introducing the key issues and activities of the subject: the terminology and fundamental concepts of the area; the main activities involved in interaction design, and the importance of user involvement in the design process. Part two addresses the key activity in interaction design: establishing requirements for an interactive product and focusing on making the product usable for the intended population. The third part covers the techniques and knowledge necessary to design an interactive product that is accessible and useful to the people who are expected to use it. Part four presents the techniques and knowledge necessary to design and evaluate an interactive product.
Mode of delivery:
Face-to-face teaching, self-study
Learning activities and teaching methods:
Lectures 18h, assignments or one larger assignment and presentation 56h, exam 34h.
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:
Sharp, Rogers and Preece (2007, 2nd or later edition) *Interaction Design: Beyond Human-Computer Interaction* and lecture and assignment materials.
Assessment methods and criteria:
Assignments/assignment and presentation, exam.

Grading:
assignment pass/fail, exam 1-5
Person responsible:
Anna-Liisa Syrjänen, itsenäinen tapa
Netta Iivari, luennot
Working life cooperation:
No

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

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

817610S: Doing Software Business in China, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Xiaosong Zheng

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
1 st – 2 nd year, spring semester, period 4

Learning outcomes:
After completion of the course, students will have a comprehensive understanding of software as a business and an industry in China. Students will recognise success factors, business models and development trends of the software business in China. Students will also understand the special characteristics of the software business in China.
Contents:
In the course a number of software business topics will be covered and these include: the current software market in China; software products and services in China; internationalisation and globalisation; revenue generation concepts; business planning in China; financing, pricing, cost and profitability; offer calculation; software engineering processes, and business project and entrepreneurship in China.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20h, assignment 60h, and exam 54. In the lectures much of the time will be devoted to discussing specific topics in small groups and among the class as a whole. In addition, case studies, home assignments and in-class presentation will be used. For the home assignment students are required to form a group (2 students per group) to complete a written report on a specific software business topic.
Recommended or required reading:
There is no prescribed textbook for this course. Instead, a reading brick comprising lecture notes, book chapters, journal articles and case studies relating to the various topics being covered will be made available for downloading.
Assessment methods and criteria:
1) Exam (50%), 2) home assignment and in-class presentation (50%).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Xiaosong Zheng
Working life cooperation:
No

815308A: Embedded Software Development Environments, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Henrik Hedberg

Opintokohteen kielet: English

Leikkaavuudet:

811359A	Mobile Systems Programming	6.0 op
811359A-01	Programming mobile devices, exercise work	0.0 op
811359A-02	Programming mobile devices, exam	0.0 op

ECTS Credits:
4 ECTS credits/108 hours of work

Language of instruction:
English
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 40h, exercise work 68h

Target group:

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 optional programme components:

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:
Henrik Hedberg
Working life cooperation:
No

815653S: Open Source Software Development, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Henrik Hedberg

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work

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

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

- Define the historical background and the ideology of OSS;
- Participate in an OSS development project;
- Evaluate the impact of using OSS and OSS licenses in software development and exploitation;
- View the phenomenon through essential scientific research.

Contents:
Open Source Software (OSS) is one of the most topical phenomena in software development. It affects both software production and the decisions of user organisations. OSS can be studied from different social, legal, economical, software engineering and data security viewpoints. The course covers the range of scientific findings on the OSS paradigm. The course introduces the Open Source Software (OSS) development paradigm and current topics in OSS research. The aim is to study from different viewpoints, 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 is on research work.
Mode of delivery:
Mostly face-to-face teaching but some parts are implemented as distance teaching
Learning activities and teaching methods:
Lectures and seminars about 40h, exercises about 10h, seminar paper about 58h.
Prerequisites and co-requisites:
Compulsory prerequisites are bachelor degree or other equivalent degree and basic knowledge of software engineering and research work. The course allows passing Project II following the OSS development principles or a Master's thesis on an OSS topic.
Recommended optional programme components:

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; international articles covering the topic.
Assessment methods and criteria:
Active participation and a seminar paper
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Henrik Hedberg
Working life cooperation:
No

815309A: Real Time Distributed Software Development, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Pulli

Opintokohteen kielet: English

ECTS Credits:
6 ECTS credits/160 hours of work
Language of instruction:
English
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. Multitasking, interrupts;
8. Hardware interfaces.

Characteristics of Distribution
1. Centralised;
2. Client-server;
3. Clusters ;
4. Cloud;
5. Peer-to-peer;
6. Ad hoc;
7. Concept of time;
8. Synchronisation;
9. Latency and jitter;
10. Quality of service;
11. Service discovery;
12. Networking primitives;
13. Networking platforms.

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 45h, design exercises 15h, student projects 100h.
Target group:

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

Recommended or required reading:
Lecture notes based on reference books
- Douglass B.P. (2007) Real-Time UML – Advances in the UML for Real-Time Sys-tems. Third edition. Addison-

Wesley ISBN 0-321-16076-2. 694 p.
• 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.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Petri Pulli
Working life cooperation:
No

814340A: Small-Group Tutoring, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Heli Alatalo

Opintokohteen kielet: Finnish

ECTS Credits:
3 ECTS credits/80 hours of work

Language of instruction:
Finnish
Timing:
2 nd – 5 th year, autumn and spring semester, periods 1–4

Learning outcomes:
After passing the course a student (tutor) is able to:

- Draw up a supervision plan for his/her small group;
- Put into effect his/her supervision from the viewpoint of students and based on the given tutor training;
- Receive supervision and guidance experience;
- Take responsibility for his/her own supervision work.

Contents:
1. Group training, occasions and meetings 25h
2. Planning and implementation of small-group tutoring 53h
3. Writing his/her own report diary 2h.

Mode of delivery:
Face-to-face teaching and web-based teaching.
Learning activities and teaching methods:
Lectures, exercises and meetings. Practice as a small-group tutor in co-operation with other tutors, Blanko student organisation, library and own department's study-counsellors. Independent personal work.
Recommended or required reading:
Training materials, forms and own reports.
Assessment methods and criteria:
Active participation in tutor-training, implementing small-group tutoring and drawing up the supervision plan and the report diary.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail

Person responsible:
Heli Alatalo
Working life cooperation:
No

817602S: Software Development in Global Environment, 5 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Information Processing Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Similä, Jouni Kalervo
Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/135 hours of work.

Language of instruction:
English
Timing:

1 st year of Master's studies, fall semester.
Learning outcomes:
After completing the course, the student

- Can define the key success factors of Global Software Design (GSD) and the potential problems in coordination of projects where teams are separated by physical and/or temporal distance;
- Can define and evaluate the collaborative technologies, which in the best way support distributed software development;
- Can choose the methods and tools for distributed software development;
- Can apply the practices of GSD in a student project and use the supporting tools throughout the project life cycle.

Contents:
Some of the topics covered are strategic issues in distributed development (off-shoring, near-shoring, outsourcing, OSS); cost-benefit-risk analysis; the triad of coordination, control and communication; team building (e.g. virtual teams); software process paradigms in the global environment (planned, agile); methods and tools for distributed software development; issues related to allocation of tasks; communication issues that arise due to distance and time zone differences; infrastructure support; geographical dispersion; lack of information communication; coordination complexity; cultural issues; technical issues related to information and artefact sharing; architectural design; and finally knowledge management issues. The lectures and seminars also review current research aspects of the GSD and related case studies from industry. The exercises demonstrate distributed software development as a virtual team with the support of appropriate methods and tools.

Mode of delivery:
Face-to-face lectures and seminars with all the students. Lecture assignments: reading articles and writing analyses. Communication between exercise groups of 4 students is done over the internet.

Learning activities and teaching methods:
Lectures and seminars involving all the students as well as lecture assignments (reading articles and writing analyses) 70h (20h lecture attendances, 30h lecture assignments, 20h additional reading), and exercises 65h. For lecture assignments each student will read, summarize and analyse selected academic articles. The exercises include laboratory demonstrations of different supporting tools for distributed software development. The students train in project software development and planning practices in a distributed environment. The student project groups are organised into virtual (distributed) teams of 4 students.
Target group:
Obligatory course for students majoring in Software Engineering and GS3D.

Recommended or required reading:
To be announced during the course implementation.
Assessment methods and criteria:
By active participation or alternatively exam, based on the course study materials.

Grading:
1–5, active participation: lectures (25%), lecture assignments (25%), exercises (50%).

Person responsible:
Jouni Similä
Working life cooperation:
No
Other information:
Participation: The course is obligatory for GS ^{3}D students and software engineering students; the total number of students is limited according to the departmental selection rule (valintasääntö, kts. Opinto-opas). 80% attendance is required. Web page **:** http://www.tol.oulu.fi/index.php?id=1125

815660S: Software Engineering Management, Measurement and Improvement, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Maria Rodriguez

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work

Language of instruction:
English
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.
Learning activities and teaching methods:
Lectures 18h, study group working 25h, paper reading 25h, seminar 20h, report writing 20h
Target group:

Prerequisites and co-requisites:
B.Sc. or other equivalent degree and basic knowledge of software engineering
Recommended optional programme components:

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

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Pilar Rodriguez
Working life cooperation:
No

815310A: Software Production and Maintenance, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Saukkonen, Samuli

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 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:

- 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, 88h.
Target group:

Prerequisites and co-requisites:
Basic knowledge of software engineering and software architectures.

Recommended optional programme components:

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.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Samuli Saukkonen
Working life cooperation:
No

815311A: Software Quality and Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

812670S: The Next Generation of the Web, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Oinas-Kukkonen, Harri Ilmari

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, spring semester, period 3
Learning outcomes:
After completing the course the student is able to:

- Apply the lessons learned for web design, organisational purposes and entrepreneurial activities; and
- Analyse issues related to web’s development stages and trends and potentially even to predict potential future web;
- Develop businesses based on technology road mapping, scenario thinking, future forecasting, and research methods and theories of technological innovation and diffusion.

Contents:

The course will help the student to recognise and reflect on on-going and potential future web development trends. It will build upon understanding of the contemporary web, its conceptual background, and the changes that lead to the web we see today. The ultimate goal for the course is to foresee the potential future of the web for the upcoming five years. Thus, the name of the course is The Next Generation of the Web.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures/seminars 24h, independent work 110h
Target group:

Prerequisites and co-requisites:
A one page motivation needs to be submitted to the course assistant (salman.mian@oulu.fi) before the registration deadline. The text in English should elaborate on individual's motivation for taking the course and the expectations. This on par with already accomplished studies and their grades will be taken into account in the student selection procedure. The accepted students will be notified through an email, a week after the registration deadline.
Note: Only a limited number of students will be accepted for the course.
Course “813619S Emerging Technologies and Issues” (recommended).

Recommended optional programme components:

Recommended or required reading:
Scientific articles, the web. More sources to be announced specifically during the course implementation.
Oinas-Kukkonen Harri & Oinas-Kukkonen Henry (2013) Humanizing the Web: Change and Social Innovation. Palmgrave Macmillan, Basingstoke, UK.
Assessment methods and criteria:
Participation in the lectures, student paper (only in English).

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No
Other information:
All questions regarding the course should be directed to Salman Mian (salman.mian@oulu.fi).
The registration for this course is CLOSED and participants limit reached.

812671S: Usability Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Rajanen

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/135 hours of work

Language of instruction:
English and Finnish
Timing:
1 st – 2 nd year of Master's studies, spring semester, 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:
1 st and 2 nd year Master 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:

Structure and contents of the course are based on:

- · 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:
Pass/fail
Person responsible:
Mikko Rajanen
Working life cooperation:
No
Other information:

814601S: Work Experience in ICT responsibilities, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna-Liisa Syrjänen

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits/ (four months of full time work)

Language of instruction:
Finnish/English
Timing:
Free
Learning outcomes:
After completing the course, a student:

- Masters professional ICT work in enterprises or public organisations;
- Can analyse and reflect on the work experience in Information Processing Science studies;
- Can write an informative report of his/her work experience.

Contents:

1. Working at least four months in professional ICT duties that require university level studies.
2. Analysing, reflecting and reporting on the work.

Mode of delivery:
Student’s own work, self-study.
Learning activities and teaching methods:
Professional ICT responsibilities and at least four months to fulfil the learning outcomes.
Target group:

Recommended optional programme components:

Recommended or required reading:
Studies and selected course materials are reflected on experience in professional ICT work.
Assessment methods and criteria:
Working on professional ICT responsibilities altogether for at least four months. Write a work report of 4 to 8 pages. The work experience is proved by delivering a signed letter of reference and transcript of records in Information

Processing Science studies. Work experience can consist of more than one separate period with different employers. The student is required to document the levels of university studies needed to realise the professional work. Proposals to evaluate and develop the studies in the Information Processing Science curricula must be documented in the report.
Grading:
Pass/fail
Person responsible:
Anna-Liisa Syrjänen
Working life cooperation:
Yes; working on professional ICT responsibilities.

Other information:

817610S: Doing Software Business in China, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Xiaosong Zheng

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
1 st – 2 nd year, spring semester, period 4

Learning outcomes:
After completion of the course, students will have a comprehensive understanding of software as a business and an industry in China. Students will recognise success factors, business models and development trends of the software business in China. Students will also understand the special characteristics of the software business in China.
Contents:
In the course a number of software business topics will be covered and these include: the current software market in China; software products and services in China; internationalisation and globalisation; revenue generation concepts; business planning in China; financing, pricing, cost and profitability; offer calculation; software engineering processes, and business project and entrepreneurship in China.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20h, assignment 60h, and exam 54. In the lectures much of the time will be devoted to discussing specific topics in small groups and among the class as a whole. In addition, case studies, home assignments and in-class presentation will be used. For the home assignment students are required to form a group (2 students per group) to complete a written report on a specific software business topic.
Recommended or required reading:
There is no prescribed textbook for this course. Instead, a reading brick comprising lecture notes, book chapters, journal articles and case studies relating to the various topics being covered will be made available for downloading.
Assessment methods and criteria:
1) Exam (50%), 2) home assignment and in-class presentation (50%).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Xiaosong Zheng
Working life cooperation:
No

813619S: Emerging Technologies and Issues, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Oinas-Kukkonen, Harri Ilmari

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 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:
24h lectures, 84h independent work.

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.

Assessment methods and criteria:
Exam (only in English)
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No
Other information:

All questions regarding the course should be directed to Salman Mian (salman.mian@oulu.fi).

812350A: Enterprise Systems, 4 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Information Processing Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Li Zhao
Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work
Language of instruction:
English
Timing:
1st year of Master's and GS3D studies, spring semester, period 4

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.

Learning activities and teaching methods:
The overall workload for each student in this course is 108 hours. Lectures (24h), exercises (14h), homework (15h), essay (25 h), examination (30h).

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

812349A: IT Infrastructure, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Öörni

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
English
Timing:
1st year of Master's studies, spring semester, period 1

Learning outcomes:
After completing the course, students are able to judge, compare and apply data communications concepts to various situations encountered in industry; identify general concepts and techniques of data communications; explain the technology of the Internet; identify the most important server and storage architectures and the main mechanisms for providing high-capacity processing and storage capacity; and explain the regulatory environ-ment.
Contents:
1. Introduction to large-scale computing applications;
2. Network requirements and architecture;
3. Standards and standards bodies;
4. Network services and Middleware;
5. Internet services, protocols and technologies;
6. Underlying network technologies;
7. Performance monitoring, fault detection, recovery and restoration;
8. Next-generation network infrastructure, industry technology directions.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures (24 h), student project work (90 h) and examination (20 h).
Target group:

Prerequisites and co-requisites:
Student is familiar with basic computer architecture and the Internet.
Recommended optional programme components:

Recommended or required reading:
- Lecture notes;
- Supplementary technical and scientific articles;
- Phil Simon (2010) The next wave of technologies: opportunities from chaos. Wiley. ISBN 0-47-058750-4.

Reference books:
- Comer, D.E. (2009) Computer Networks and Internets. 5th edition. Pearson ISBN 0-13-504583-5. 600 p.
- Kurose J.F., Ross K.W. (2010) Computer Networking – A Top-Down Approach. 5th edition. Pearson ISBN 0-13-136548-7. 888 p.
- Travostino F., Mambretti J., Karmous-Edwards G. (2006) Grid Networks – Enabling grids with advanced communication technology. Wiley ISBN 0-470-01748-1. 340 p.

Assessment methods and criteria:
Individual project work, examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Anssi Öörni
Working life cooperation:
No

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

Voimassaolo: 01.08.1950 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: 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 1

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
Working life cooperation:
No

814340A: Small-Group Tutoring, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Heli Alatalo

Opintokohteen kielet: Finnish

ECTS Credits:
3 ECTS credits/80 hours of work

Language of instruction:
Finnish
Timing:
2 nd – 5 th year, autumn and spring semester, periods 1–4

Learning outcomes:
After passing the course a student (tutor) is able to:

- Draw up a supervision plan for his/her small group;
- Put into effect his/her supervision from the viewpoint of students and based on the given tutor training;
- Receive supervision and guidance experience;
- Take responsibility for his/her own supervision work.

Contents:
1. Group training, occasions and meetings 25h
2. Planning and implementation of small-group tutoring 53h
3. Writing his/her own report diary 2h.

Mode of delivery:
Face-to-face teaching and web-based teaching.
Learning activities and teaching methods:
Lectures, exercises and meetings. Practice as a small-group tutor in co-operation with other tutors, Blanko student organisation, library and own department's study-counsellors. Independent personal work.
Recommended or required reading:
Training materials, forms and own reports.
Assessment methods and criteria:
Active participation in tutor-training, implementing small-group tutoring and drawing up the supervision plan and the report diary.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail

Person responsible:
Heli Alatalo
Working life cooperation:
No

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

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

812670S: The Next Generation of the Web, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Oinas-Kukkonen, Harri Ilmari

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, spring semester, period 3
Learning outcomes:
After completing the course the student is able to:

- Apply the lessons learned for web design, organisational purposes and entrepreneurial activities; and
- Analyse issues related to web's development stages and trends and potentially even to predict potential future web;
- Develop businesses based on technology road mapping, scenario thinking, future forecasting, and research methods and theories of technological innovation and diffusion.

Contents:

The course will help the student to recognise and reflect on on-going and potential future web development trends. It will build upon understanding of the contemporary web, its conceptual background, and the changes that lead to the web we see today. The ultimate goal for the course is to foresee the potential future of the web for the upcoming five years. Thus, the name of the course is The Next Generation of the Web.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures/seminars 24h, independent work 110h
Target group:

Prerequisites and co-requisites:
A one page motivation needs to be submitted to the course assistant (salman.mian@oulu.fi) before the registration deadline. The text in English should elaborate on individual's motivation for taking the course and the expectations. This on par with already accomplished studies and their grades will be taken into account in the student selection procedure. The accepted students will be notified through an email, a week after the registration deadline.
Note: Only a limited number of students will be accepted for the course.
Course "813619S Emerging Technologies and Issues" (recommended).

Recommended optional programme components:

Recommended or required reading:
Scientific articles, the web. More sources to be announced specifically during the course implementation.
Oinas-Kukkonen Harri & Oinas-Kukkonen Henry (2013) Humanizing the Web: Change and Social Innovation. Palmgrave Macmillan, Basingstoke, UK.
Assessment methods and criteria:
Participation in the lectures, student paper (only in English).

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No
Other information:
All questions regarding the course should be directed to Salman Mian (salman.mian@oulu.fi).
The registration for this course is CLOSED and participants limit reached.

812671S: Usability Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Rajanen

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/135 hours of work

Language of instruction:
English and Finnish
Timing:
1 st – 2 nd year of Master's studies, spring semester, 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:
1 st and 2 nd year Master 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:
Structure and contents of the course are based on:

- · 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:
Pass/fail
Person responsible:
Mikko Rajanen
Working life cooperation:
No
Other information:

814601S: Work Experience in ICT responsibilities, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna-Liisa Syrjänen

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits/ (four months of full time work)

Language of instruction:
Finnish/English
Timing:
Free
Learning outcomes:
After completing the course, a student:

- Masters professional ICT work in enterprises or public organisations;
- Can analyse and reflect on the work experience in Information Processing Science studies;
- Can write an informative report of his/her work experience.

Contents:

1. Working at least four months in professional ICT duties that require university level studies.
2. Analysing, reflecting and reporting on the work.

Mode of delivery:
Student's own work, self-study.
Learning activities and teaching methods:
Professional ICT responsibilities and at least four months to fulfil the learning outcomes.
Target group:

Recommended optional programme components:

Recommended or required reading:
Studies and selected course materials are reflected on experience in professional ICT work.
Assessment methods and criteria:
Working on professional ICT responsibilities altogether for at least four months. Write a work report of 4 to 8 pages. The work experience is proved by delivering a signed letter of reference and transcript of records in Information Processing Science studies. Work experience can consist of more than one separate period with different employers. The student is required to document the levels of university studies needed to realise the professional work. Proposals to evaluate and develop the studies in the Information Processing Science curricula must be documented in the report.
Grading:
Pass/fail
Person responsible:
Anna-Liisa Syrjänen
Working life cooperation:
Yes; working on professional ICT responsibilities.

Other information:

817604S: ICT and Organizational Change, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Öörni

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English

Timing:
2nd year, spring semester, periods 2+3
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:
Anssi Öörni
Working life cooperation:
No

812349A: IT Infrastructure, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Öörni

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work

Language of instruction:
English
Timing:
1st year of Master's studies, spring semester, period 1

Learning outcomes:
After completing the course, students are able to judge, compare and apply data communications concepts to various situations encountered in industry; identify general concepts and techniques of data communications; explain the technology of the Internet; identify the most important server and storage architectures and the main mechanisms for providing high-capacity processing and storage capacity; and explain the regulatory environ-ment.
Contents:
1. Introduction to large-scale computing applications;
2. Network requirements and architecture;
3. Standards and standards bodies;
4. Network services and Middleware;
5. Internet services, protocols and technologies;
6. Underlying network technologies;
7. Performance monitoring, fault detection, recovery and restoration;
8. Next-generation network infrastructure, industry technology directions.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures (24 h), student project work (90 h) and examination (20 h).
Target group:

Prerequisites and co-requisites:
Student is familiar with basic computer architecture and the Internet.
Recommended optional programme components:

Recommended or required reading:
- Lecture notes;
- Supplementary technical and scientific articles;
- Phil Simon (2010) The next wave of technologies: opportunities from chaos. Wiley. ISBN 0-47-058750-4.

Reference books:
- Comer, D.E. (2009) Computer Networks and Internets. 5th edition. Pearson ISBN 0-13-504583-5. 600 p.
- Kurose J.F., Ross K.W. (2010) Computer Networking – A Top-Down Approach. 5th edition. Pearson ISBN 0-13-136548-7. 888 p.
- Travostino F., Mambretti J., Karmous-Edwards G. (2006) Grid Networks – Enabling grids with advanced communication technology. Wiley ISBN 0-470-01748-1. 340 p.

Assessment methods and criteria:
Individual project work, examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Anssi Öörni
Working life cooperation:
No

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

Voimassaolo: 01.08.1950 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: 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 1

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
Working life cooperation:
No

813624S: Information Systems Theory, 7 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

7 ECTS credits/187 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 (40.5h), class preparation 1.5 ECTS (40.5h), and exercises 4 ECTS (107h).

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, active participation in class, class quizzes, research proposal, and research essay are assessed. Note that there is no final exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Tero Vartiainen
Working life cooperation:
No
Other information:
Course material can be found at OPTIMA e-learning environment, Urkund is used for course work submissions.

813613S: Master's Thesis, 30 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
30 ECTS credits/800 hours of work.

Language of instruction:
Finnish/English.

Timing:
Timing is free; execution can be allocated over several semesters. Obligatory for Master's degree. During 1st and 2nd year of Master's studies.
Learning outcomes:
After completing the thesis the student can:

- Define a relevant focused problem in the field of information processing science;
- Apply a scientific method as a tool in solving the stated research problem;
- Synthesise research results and evaluate their validity;
- Write a scientific thesis based on the accomplished research according to the de-partment's guidelines;
- Participate in the evolution of ICT and postgraduate studies after completing the thesis.

Mode of delivery:
Face-to-face meetings and electronic communication with the supervisor.

Learning activities and teaching methods:
Conducting and reporting research under supervision of personal advisor.
Prerequisites and co-requisites:
The research plan and the final draft of the thesis will be presented in the "Master's Thesis Seminar" (813602S).

Assessment methods and criteria:
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The supervisor and a second independent reviewer will evaluate the thesis using the scale 1–5.
Person responsible:
Kari Kuutti, Ilkka Tervonen

Working life cooperation:
Especially empirical Master's theses are often done in cooperation with private or public sector.

815653S: Open Source Software Development, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Henrik Hedberg

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work

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

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

- Define the historical background and the ideology of OSS;
- Participate in an OSS development project;
- Evaluate the impact of using OSS and OSS licenses in software development and exploitation;

- View the phenomenon through essential scientific research.

Contents:
Open Source Software (OSS) is one of the most topical phenomena in software development. It affects both software production and the decisions of user organisations. OSS can be studied from different social, legal, economical, software engineering and data security viewpoints. The course covers the range of scientific findings on the OSS paradigm. The course introduces the Open Source Software (OSS) development paradigm and current topics in OSS research. The aim is to study from different viewpoints, 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 is on research work.
Mode of delivery:
Mostly face-to-face teaching but some parts are implemented as distance teaching
Learning activities and teaching methods:
Lectures and seminars about 40h, exercises about 10h, seminar paper about 58h.
Prerequisites and co-requisites:
Compulsory prerequisites are bachelor degree or other equivalent degree and basic knowledge of software engineering and research work. The course allows passing Project II following the OSS development principles or a Master's thesis on an OSS topic.
Recommended optional programme components:

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; international articles covering the topic.
Assessment methods and criteria:
Active participation and a seminar paper
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Henrik Hedberg
Working life cooperation:
No

810129P: Orientation Studies for International Students, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Marianne Kinnula

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work
Language of instruction:
English
Timing:
1 st year of GS 3D studies, autumn semester, period 1+2

Learning outcomes:
After passing the course a student:

- Knows the basics of Finnish culture and the Finnish university system;
- Knows the city of Oulu and its services;
- Is able to discuss multicultural features and competencies within ICT business and academic life;

- Is able to exploit services of the most important organisations, units and communities (e.g. own department TOL, own student guild Blanko and Tellus library of own faculty) from the viewpoint of his/her studies and knows how to influence in this environment;
- Recognises the basic characteristics of his/her own curriculum;
- Is able to plan his/her own studies and forthcoming study path;
- Is able to create, update and present his/her Personal Study Plan (PSP).

Contents:

- Finnish culture and university system;
- Multicultural communication, ICT business and academic life;
- City of Oulu, University of Oulu, the study environment and student influence in it;
- Own department, own student guild, own curriculum and own study path;
- PSP and PSP process.

Mode of delivery:
Blended teaching
Learning activities and teaching methods:
Group occasions, lectures, exercises and seminars (60h), teacher tutoring (8h), student tutoring (8h), personal supervision discussions (4h), independent personal work (28h).

Target group:

Recommended or required reading:
Lecture materials by web-based learning environments, www pages, study guides, brochures, forms, etc.
Assessment methods and criteria:
Active participation, PSP, other required reports

Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail
Person responsible:
Marianne Kinnula
Working life cooperation:
No

813621S: Research Methods, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

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

813630S: Software Business Development, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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 autumn semester, during period 2. It is recommended to complete the course in the first or second year of Master's studies.

Learning outcomes:
The course provides insights to business development on a business, company and industry level. After completing the course, the student is able to plan how business is being developed over the whole life cycle of the business and company, conduct market and business analyses, identify different sources of financing for business operation,

evaluate different strategic business options and select a business model adequate for the present and future situation of the company.
Contents:
The course takes three points of view: company start-up, established business, and software industry. The course introduces the concepts of business idea, business plan, software business models and strategies, and the software value network.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 24h, exercises 12h, course assignments 78h, exam 20h. The course assignments will be conducted as group work.

Target group:

Prerequisites and co-requisites:
The recommended prerequisite is the completion of the following courses prior to enrolling for the course unit: 811174P Introduction to Software Business, 813316A Business Process Modelling and 813620S Software Business and IT Management.
Recommended or required reading:
Refer to the course web pages

Assessment methods and criteria:
This course unit utilizes continuous assessment. Lectures are for the most part voluntarily, but participation is recommended. The students will write course assignments which will be assessed. 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:
1–5
Person responsible:
Jukka Kontula
Working life cooperation:
No

813620S: Software Business Management, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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 2

Learning outcomes:

After completing the course, the student:

- Is able to assess the main problem areas in software business management and is able to describe how to manage these problems;
- Is able to find, when needed, different kinds of tools for managing this diverse and ambiguous environment;
- Is able to describe how to manage competent and creative persons who often have strong personalities;
- Is 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;
- Understands the significance and role of IT decisions in business strategy.

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. In IT, management value is created through technology and alignment of technology and business strategies. Business and technology management need to work together.

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

817602S: Software Development in Global Environment, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Similä, Jouni Kalervo

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/135 hours of work.

Language of instruction:
English
Timing:

1 st year of Master's studies, fall semester.
Learning outcomes:
After completing the course, the student

- Can define the key success factors of Global Software Design (GSD) and the potential problems in coordination of projects where teams are separated by physical and/or temporal distance;

- Can define and evaluate the collaborative technologies, which in the best way support distributed software development;
- Can choose the methods and tools for distributed software development;
- Can apply the practices of GSD in a student project and use the supporting tools throughout the project life cycle.

Contents:
Some of the topics covered are strategic issues in distributed development (off-shoring, near-shoring, outsourcing, OSS); cost-benefit-risk analysis; the triad of coordination, control and communication; team building (e.g. virtual teams); software process paradigms in the global environment (planned, agile); methods and tools for distributed software development; issues related to allocation of tasks; communication issues that arise due to distance and time zone differences; infrastructure support; geographical dispersion; lack of information communication; coordination complexity; cultural issues; technical issues related to information and artefact sharing; architectural design; and finally knowledge management issues. The lectures and seminars also review current research aspects of the GSD and related case studies from industry. The exercises demonstrate distributed software development as a virtual team with the support of appropriate methods and tools.

Mode of delivery:
Face-to-face lectures and seminars with all the students. Lecture assignments: reading articles and writing analyses. Communication between exercise groups of 4 students is done over the internet.

Learning activities and teaching methods:
Lectures and seminars involving all the students as well as lecture assignments (reading articles and writing analyses) 70h (20h lecture attendances, 30h lecture assignments, 20h additional reading), and exercises 65h. For lecture assignments each student will read, summarize and analyse selected academic articles. The exercises include laboratory demonstrations of different supporting tools for distributed software development. The students train in project software development and planning practices in a distributed environment. The student project groups are organised into virtual (distributed) teams of 4 students.
Target group:
Obligatory course for students majoring in Software Engineering and GS3D.

Recommended or required reading:
To be announced during the course implementation.
Assessment methods and criteria:
By active participation or alternatively exam, based on the course study materials.

Grading:
1–5, active participation: lectures (25%), lecture assignments (25%), exercises (50%).

Person responsible:
Jouni Similä
Working life cooperation:
No
Other information:
Participation: The course is obligatory for GS ^{3}D students and software engineering students; the total number of students is limited according to the departmental selection rule (valintasääntö, kts. Opinto-opas). 80% attendance is required. Web page **:** http://www.tol.oulu.fi/index.php?id=1125

815660S: Software Engineering Management, Measurement and Improvement, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Maria Rodriguez

Opintokohteen kielet: English

ECTS Credits:

4 ECTS credits/108 hours of work

Language of instruction:
English
Timing:
2 nd year of Master's and GS 3D 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.
Learning activities and teaching methods:
Lectures 18h, study group working 25h, paper reading 25h, seminar 20h, report writing 20h
Target group:

Prerequisites and co-requisites:
B.Sc. or other equivalent degree and basic knowledge of software engineering
Recommended optional programme components:

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

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Pilar Rodriguez
Working life cooperation:
No

815661S: Software Engineering Research, 7 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Burak Turhan

Opintokohteen kielet: English

ECTS Credits:
7 ECTS credits/187 hours of work

Language of instruction:
English
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:
Research areas in software engineering, research methods.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures, assignments related to lectures, presentations, report. Lectures and seminars 42h, assignments 105h, report 40h.
Target group:

Prerequisites and co-requisites:
B.Sc. or other equivalent degree
Recommended optional programme components:

Recommended or required reading:
Wohlin C., Runeson P., Höst M., Ohlsson M., Regnell B., Wesslen A., Experimentation in Software Engineering, Kluwer Academic Publishers, 2000, lecture material, software engineering scientific literature.

Assessment methods and criteria:
Assignments related to lectures, report. There is no final exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Burak Turhan
Working life cooperation:
No
Other information:
Course material can be found at Optima.

817611S: Software Factory Project Course, 11 op

Voimassaolo: 01.03.2014 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Liukkunen

Opintokohteen kielet: English

ECTS Credits:
11 ECTS credits / 300 hours of work
Language of instruction:
English

Timing:
The course is held three times a year: in the autumn semester, periods 1 and 2; spring semester, periods 3 and 4; summer, from June to October
Learning outcomes:
After completing the course students should demonstrate their abilities to work on a global ICT project. Students will apply new knowledge in the topic of the project, as well as to analyse and report the created new knowledge to peer student groups. Students will also demonstrate their skills to conduct global ICT project. Additionally, the students will use up to date software engineering methods, techniques and tools in global distributed environment.

After successfully completing the software factory project, students are able to:

- Demonstrate issues within the software development life cycle and critically evaluate personal performance especially in distributed context.
- Apply advanced software engineering methods, tools and techniques and technical knowledge of the specific project domain within that context to satisfy specific project requirements.
- Generate technical documents according to relevant standards, and apply appropriate tracking and control procedures
- Cooperate with client and provide technical presentations at various phases of the project

Demonstrate project practices when conducting meetings and code reviews. Manage and report the progress of the project with the steering grou
Contents:
Starting lectures, where the steps of carrying out the course will be described together with allocating the project assignments to project teams. Also, Software Factory working methods are presented. During the course students attend intense software development project in a global distributed team.
Mode of delivery:
Face-to-face teaching at the beginning of the course together with web-based learning environment. During the project work student work in both collocated and globally distributed teams. Each of the project group will be supported with a supervisor.
Learning activities and teaching methods:
The course work load is 300h per student (9h lectures and 291h project work). Working hours will be reported during the project. Attendance at the starting lectures and working in software factory is mandatory. Training will be given to students on the required methods, tools, and techniques at the beginning of the project work. Depending on the project the student may work on regular basis in the software factory premises.
Target group:
GS ^{3}D master's level students
Prerequisites and co-requisites:
Mandatory B.Sc. degree or other equivalent and the course Software Development in Global Environments 817602S. Preparatory course for MSc studies 811392A is recommended.
Recommended or required reading:
Project material will be provided by the customer of the project and/or material to be collected and studied by the project team.
Assessment methods and criteria:
Real application and/or prototype of software along with professional project management skills will be reported in a project portfolio. Assessment criteria will be given at the starting lecture in detail.
Grading:
1-5
Person responsible:
Kari Liukkunen
Working life cooperation:
Yes, learning project work and integrating the practices of an academic expert into the unique project assignment.

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

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

812650S: Advanced Topics in Digital Cultures and Design, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Netta Iivari, Mikko Rajanen

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/135 hours of work

Language of instruction:
English
Timing:
1 st – 2 nd year of Master's studies, spring semester, period 3

Learning outcomes:
After completing the course, students are familiar with some state-of-the-art research results related to current themes and contexts in human-centred design, they understand the strengths and limitations of various methods and frameworks used in human-centred design and they can acquire knowledge and critically read relevant research articles on human-centred design research topics.
Contents:
The content of the course will change with time. The initial set of topics includes:

- Current themes
  - User experience as an object of analysis and design
  - Participatory design, end-user-design and living labs
  - Information ecologies and infrastructures
  - Design for all
  - Iterative and incremental design and development
  - The impact of human-centred design
  - Current development contexts:
    - Open source software development
    - Game development
    - Development of ICT for children
    - Ubiquitous computing

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 20h, assignments 100h, seminars 15h

Target group:

Prerequisites and co-requisites:
Course "812335A Interaction Design" or similar knowledge.

Recommended optional programme components:

Recommended or required reading:
A collection of research papers supported with lecture materials. Students also need to collect some study material by themselves.
Assessment methods and criteria:
Depending on the implementation group and/or individual assignments, evaluated according to predefined evaluation criteria.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Netta Iivari ja Mikko Rajanen
Working life cooperation:
No

817610S: Doing Software Business in China, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Xiaosong Zheng

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/134 hours of work
Language of instruction:
English
Timing:
1 st – 2 nd year, spring semester, period 4

Learning outcomes:
After completion of the course, students will have a comprehensive understanding of software as a business and an industry in China. Students will recognise success factors, business models and development trends of the software business in China. Students will also understand the special characteristics of the software business in China.
Contents:
In the course a number of software business topics will be covered and these include: the current software market in China; software products and services in China; internationalisation and globalisation; revenue generation concepts; business planning in China; financing, pricing, cost and profitability; offer calculation; software engineering processes, and business project and entrepreneurship in China.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20h, assignment 60h, and exam 54. In the lectures much of the time will be devoted to discussing specific topics in small groups and among the class as a whole. In addition, case studies, home assignments and in-class presentation will be used. For the home assignment students are required to form a group (2 students per group) to complete a written report on a specific software business topic.
Recommended or required reading:
There is no prescribed textbook for this course. Instead, a reading brick comprising lecture notes, book chapters, journal articles and case studies relating to the various topics being covered will be made available for downloading.
Assessment methods and criteria:
1) Exam (50%), 2) home assignment and in-class presentation (50%).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Xiaosong Zheng
Working life cooperation:
No

815308A: Embedded Software Development Environments, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Henrik Hedberg

Opintokohteen kielet: English

Leikkaavuudet:

811359A	Mobile Systems Programming	6.0 op
811359A-01	Programming mobile devices, exercise work	0.0 op
811359A-02	Programming mobile devices, exam	0.0 op

ECTS Credits:
4 ECTS credits/108 hours of work

Language of instruction:
English
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 40h, exercise work 68h

Target group:

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 optional programme components:

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:
Henrik Hedberg
Working life cooperation:
No

813619S: Emerging Technologies and Issues, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Oinas-Kukkonen, Harri Ilmari

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 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:
24h lectures, 84h independent work.

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.

Assessment methods and criteria:
Exam (only in English)
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No
Other information:
All questions regarding the course should be directed to Salman Mian (salman.mian@oulu.fi).

812350A: Enterprise Systems, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Li Zhao

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work
Language of instruction:
English
Timing:
1st year of Master’s and GS3D studies, spring semester, period 4

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.

Learning activities and teaching methods:
The overall workload for each student in this course is 108 hours. Lectures (24h), exercises (14h), homework (15h), essay (25 h), examination (30h).

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

812335A: Interaction Design, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Netta Iivari, Anna-Liisa Syrjänen

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 hours of work
Language of instruction:
English
Timing:
1st year of Master’s studies, autumn semester period 2
Learning outcomes:
Objective: The course explains the role of human interaction with products and services, explains the factors and problems related to it to motivate interaction design, and teaches some methods for analysis, evaluation and design of interactions.
Learning Outcomes: After completing the course, the student can assess the role of human interaction with information technological products or 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 for graphical user interface design;
- use interaction design methods to create a novel or redesigned interactive product.

Contents:
The first part provides an overview of interaction design, introducing the key issues and activities of the subject: the terminology and fundamental concepts of the area; the main activities involved in interaction design, and the

importance of user involvement in the design process. Part two addresses the key activity in interaction design: establishing requirements for an interactive product and focusing on making the product usable for the intended population. The third part covers the techniques and knowledge necessary to design an interactive product that is accessible and useful to the people who are expected to use it. Part four presents the techniques and knowledge necessary to design and evaluate an interactive product.

Mode of delivery:
Face-to-face teaching, self-study

Learning activities and teaching methods:
Lectures 18h, assignments or one larger assignment and presentation 56h, exam 34h.

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:
Sharp, Rogers and Preece (2007, 2nd or later edition) *Interaction Design: Beyond Human-Computer Interaction* and lecture and assignment materials.

Assessment methods and criteria:
Assignments/assignment and presentation, exam.

Grading:
assignment pass/fail, exam 1-5

Person responsible:
Anna-Liisa Syrjänen, itsenäinen tapa
Netta Iivari, luennot

Working life cooperation:
No

817609S: Project Seminar, 3 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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 "Project II (817606S)" course and will immediately follow Project II in the next semester.

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 ("Project II" 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: Project II (817606S) during the previous two periods. This course will immediately follow the project course on the project topics.
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 project course (Project II, 817606S).
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 (seminar paper) and 25% on the oral presentation.

Person responsible:
Tonja Molin-Juustila
Working life cooperation:
No

815309A: Real Time Distributed Software Development, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Pulli

Opintokohteen kielet: English

ECTS Credits:
6 ECTS credits/160 hours of work
Language of instruction:
English
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. Multitasking, interrupts;
8. Hardware interfaces.

Characteristics of Distribution

1. Centralised;
2. Client-server;
3. Clusters ;
4. Cloud;
5. Peer-to-peer;
6. Ad hoc;
7. Concept of time;
8. Synchronisation;
9. Latency and jitter;
10. Quality of service;
11. Service discovery;
12. Networking primitives;
13. Networking platforms.

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 45h, design exercises 15h, student projects 100h.
Target group:

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

Recommended or required reading:
Lecture notes based on reference books

- Douglass B.P. (2007) Real-Time UML – Advances in the UML for Real-Time Sys-tems. Third edition. Addison-Wesley ISBN 0-321-16076-2. 694 p.
- 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.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Petri Pulli
Working life cooperation:
No

815310A: Software Production and Maintenance, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Saukkonen, Samuli

Opintokohteen kielet: English

ECTS Credits:
4 ECTS credits/108 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:

- 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, 88h.
Target group:

Prerequisites and co-requisites:
Basic knowledge of software engineering and software architectures.

Recommended optional programme components:

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.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Samuli Saukkonen
Working life cooperation:
No

815311A: Software Quality and Testing, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

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

812670S: The Next Generation of the Web, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Oinas-Kukkonen, Harri Ilmari

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, spring semester, period 3
Learning outcomes:
After completing the course the student is able to:

- Apply the lessons learned for web design, organisational purposes and entrepreneurial activities; and
- Analyse issues related to web's development stages and trends and potentially even to predict potential future web;
- Develop businesses based on technology road mapping, scenario thinking, future forecasting, and research methods and theories of technological innovation and diffusion.

Contents:

The course will help the student to recognise and reflect on on-going and potential future web development trends. It will build upon understanding of the contemporary web, its conceptual background, and the changes that lead to the web we see today. The ultimate goal for the course is to foresee the potential future of the web for the upcoming five years. Thus, the name of the course is The Next Generation of the Web.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures/seminars 24h, independent work 110h
Target group:

Prerequisites and co-requisites:
A one page motivation needs to be submitted to the course assistant (salman.mian@oulu.fi) before the registration deadline. The text in English should elaborate on individual's motivation for taking the course and the expectations. This on par with already accomplished studies and their grades will be taken into account in the student selection procedure. The accepted students will be notified through an email, a week after the registration deadline.
Note: Only a limited number of students will be accepted for the course.
Course "813619S Emerging Technologies and Issues" (recommended).

Recommended optional programme components:

Recommended or required reading:
Scientific articles, the web. More sources to be announced specifically during the course implementation.
Oinas-Kukkonen Harri & Oinas-Kukkonen Henry (2013) Humanizing the Web: Change and Social Innovation. Palmgrave Macmillan, Basingstoke, UK.
Assessment methods and criteria:
Participation in the lectures, student paper (only in English).

Read more about assessment criteria at the University of Oulu webpage.
Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No
Other information:
All questions regarding the course should be directed to Salman Mian (salman.mian@oulu.fi).
The registration for this course is CLOSED and participants limit reached.

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

811336A: Cooperation in information processing, 1 - 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Information Processing Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Anna-Liisa Syrjänen
Opintokohteen kielet: Finnish

ECTS Credits:
1-5 ECTS credits/27-134 hours of work
Language of instruction:
Reporting in Finnish or English.
Timing:
Free

Learning outcomes:
After completing the course, a student is able to identify the features of cooperation within some information processing tasks and raport his or her practical experiences for the development of cooperation.
Contents:
Group work coordination, cooperative workshops or tutoring in information processing tasks and experience reporting.

Mode of delivery:
Integrated with other courses, self-study.
Learning activities and teaching methods:
Agreement of cooperation, planning, cooperation, and reporting.
Target group:
Bachelor or Master level students.
Prerequisites and co-requisites:
Good knowledge on the integrated course's subject matters.
Recommended optional programme components:

Recommended or required reading:
Literature of the integrated courses.
Grading:
Pass / fail.
Person responsible:
Anna-Liisa Syrjänen
Working life cooperation:
No

813631S: Ethics of Information Systems: Classical Foundations and Current Issues, 5 op

Voimassaolo: 01.03.2014 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Information Processing Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Tero Vartiainen
Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits/ 135 hours of work
Language of instruction:
English
Timing:
Master's studies, 1-2
Learning outcomes:
After completing the course, the student:

- is able to explain how ethical issues are present in different levels of theories of information systems (IS), namely individual, group, organization and markets levels.
- is able to analyze current ethical issues in information systems (IS) with classical theories of ethics (e.g. utilitarianism, Kantian ethics, virtue ethics) and business ethics theories (e.g., stockholder and stakeholder theories) and is also able to propose solutions to those issues
- is able to produce an in-depth analysis of an IS ethics issue, assess the issue and produce interpretations on the issue and recommendations for considering the issue in IS research and practice

Contents:

1. Constructs and foundations of IS ethics
2. Theories of ethics, business ethics, and moral psychology
3. Individual, group, organization, and markets level IS theories and IS ethics
4. Current and future IS issues

Mode of delivery:
face-to-face teaching, seminar
Learning activities and teaching methods:
Pre-tasks for seminar (40 hours of work), Active participation in seminars (20 hours of work), Self-Assessments (5 hours), and Group work and its presentation (70 hours).
Target group:
Master's level students and Ph.D. students
Prerequisites and co-requisites:
Bachelor degree or other equivalent degree.
Recommended or required reading:
To be announced during the course implementation
Assessment methods and criteria:
Pre-tasks has to be acceptable level, Self-assessment of learning, Group work and its presentation.
Grading:
1-5
Person responsible:
Tero Vartiainen
Working life cooperation:
No
Other information:
Course material can be found at OPTIMA e-learning environment, Urkund is used for course work submissions.

812651S: ICT and Behaviour Change, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

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 and GS 3D studies, period 3

Learning outcomes:
After completing the course the student is able to:
- Analyse methods and techniques that are used for persuasion;
- Apply these in an ethical manner as design guidelines for developing applications, targeting changes in human behaviour or attitudes.

Contents:
Attitudinal theories from social psychology have been quite extensively applied to the study of user intentions and behaviour. These theories have been developed mostly for predicting user acceptance of information technology

rather than for providing systematic analysis and design methods for developing software solutions that aim at attitude or behaviour change. At the same time a growing number of information technology systems and services are being developed for these purposes. This course will focus on persuasive technology. It will address the process of designing and evaluating persuasive systems, the types of content and software functionality in such systems, the underlying assumptions behind these, methods for analysing the persuasion context, and principles for persuasive system design. Positive examples of persuasive systems include motivating knowledge workers to do their work better or safer and embracing citizens for healthy living habits. Negative examples are games that inflict addiction. Both sides of influence will be discussed.

Mode of delivery:
Face-to-face teaching, Twitter
Learning activities and teaching methods:
Lectures 24h, reflective personal exercises 30h, independent work 80h (readings for the lectures 12h, assignments 68h)
Target group:

Prerequisites and co-requisites:
Understanding the roles of humans as users and developers of ICT
Recommended optional programme components:
Emerging Technologies and Issues
Recommended or required reading:
Research articles to be announced more specifically during the course implementation.
Assessment methods and criteria:
Participation in the lectures, personal reflection reports, course assignments.
Grading:
1–5
Person responsible:
Harri Oinas-Kukkonen
Working life cooperation:
No

814311A: Internship in ICT-duties, 3 - 5 op

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna-Liisa Syrjänen

Opintokohteen kielet: Finnish

Person responsible:
Anna-Liisa Syrjänen

811392A: Preparatory Course for MSc Studies, 5 op

Voimassaolo: 01.03.2014 - 31.12.2018

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
2 ECTS credits / 54 hours of work
Language of instruction:
English.
Timing:
1 st year of Master’s studies, period 1.
Learning outcomes:

After completing the course, the student is able to participate in courses requiring basic knowledge of project work. The student is able to apply the basic concepts of project work, act in different roles in projects and is able to describe the significance of the different project outcomes, such as project plan, mid-reports and final reports. The student is able to define the principles of project coordination and communication with the project interest groups. Additionally, the student is able to consider the principles of referenced and scientific writing.

Contents:

The focus of the course is in the people, process and tools of a project in information technology field. Course covers the basic principles of project management, planning, coordination and communication within the project as well as outside the project. Course presents the different outcomes of the project, related to internal and external communication – project plans, mid-report, final reports and other project specific outcomes, as well as internal reports, memos and non-written communication and coordination techniques in a project. The latter include unofficial and official meetings held within the project as well as among the external interest groups of the project (for example, customers and the project steering group). Finally, the course presents the basics of written referenced and scientific communication – how to use references, how to acknowledge work of others, how to format an article and what is plagiarization and how to avoid plagiarization.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures and exercises 20h, independent learning methods 34h.

Target group:

Master's students who have no basic knowledge of professional project management and/or scientific writing. Note that it is not possible to take both this and these related courses: 811311A Project management principles and 811382A Introduction to research work.

Prerequisites and co-requisites:

BSc degree in Information Technology or equivalent field.

Recommended optional programme components:

Especially recommended to take before these courses: Project II, Software factory project course.

Recommended or required reading:

Provided when the course starts

Assessment methods and criteria:

Active participation in the lectures and exercises.

Grading:

Passed/failed

Person responsible:

Antti Juustila

Working life cooperation:

No

815338A: Principles of Programming Languages, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits/135 hours of work

Timing:

2 nd year, spring semester, period 3

Learning outcomes:

After completing the course, the student is able to explain the general principles and structures concerning design and implementation of programming languages. Furthermore, the student can compare properties of different programming languages. The student is able to explain the influence of aforementioned principles on usage and implementation of a programming language. Moreover, the student masters the basics of imperative programming and can describe the principle ideas of abstract data types, object-oriented programming, and exception handling. The student can explain the basic concepts of functional programming, logic programming and concurrent programming.

Contents:

History of programming languages, Syntax and semantics of programming languages, Abstract data types and object-oriented programming, Exception handling, Logic programming, Concurrent programming.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 36h, laboratory exercises 24h, and independent work 75h
Prerequisites and co-requisites:
Courses “Introduction to Programming”, “Programming Assignment”, or similar knowledge.

Recommended or required reading:

- Sebesta, Robert W.: Concepts of Programming Languages 5th edition, Addison-Wesley 2002 (or later).
- Harsu, Maarit: Ohjelmointikielet, Periaateet, käsitteet, valintaperusteet, Talentum 2005.

Assessment methods and criteria:
Final exam.
Grading:
1-5
Person responsible:
Ari Vesanen
Working life cooperation:
No