

# Opasraportti

(2011 - 2012)

## Tutkintorakenteet

### Degree Programme in Information Processing Science, Bachelor Level Studies

Tutkintorakenteen tila: published

Lukuvuosi: 2011-12

Lukuvuoden alkamispäivämäärä: 01.08.2011

#### 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 47 op)

811108P: Basics of Project Work and Management, 3 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

811122P: Introduction to Programming, 5 op

811174P: Introduction to Software Business, 5 op

811176P: Programming Assignment, 2 op

#### Intermediate Studies (vähintään 95 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  
 811391A: Requirements Construction, 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: 2011-12

Lukuvuoden alkamispäivämäärä: 01.08.2011

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

813613S: Master's Thesis, 30 op  
 813602S: Master's thesis seminar, 2 op  
 812631S: Project II, 14 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  
 812651S: ICT and Behaviour Change, 5 op  
 815653S: Open Source Software Development, 4 op  
 814601S: Progressive sandwich training, 5 op  
 815309A: Real Time Distributed Software Development, 6 op  
 814340A: Small-Group Tutoring, 3 op  
 813620S: Software Business Management, 5 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  
 812671S: User Experience (UX) and Usability Evaluation, 5 op

#### **Optional Studies for SE Oriented Module Students**

817610S: Doing Software Business in China, 5 op  
 812350A: Enterprise Systems, 4 op  
 812651S: ICT and Behaviour Change, 5 op  
 817604S: ICT and Organizational Change, 5 op  
 812349A: IT Infrastructure, 5 op  
 813623S: Information Security Policy and Management in Organisations, 5 op  
 812335A: Interaction Design, 4 op  
 814601S: Progressive sandwich training, 5 op  
 814340A: Small-Group Tutoring, 3 op  
 813620S: Software Business Management, 5 op  
 817603S: System Design Methods for Information Systems, 5 op  
 812671S: User Experience (UX) and Usability Evaluation, 5 op

#### **Minor or other studies**

## **Master's Degree Programme in Software, Systems and Service Development (GS3D)**

Tutkintorakenteen tila: published

Lukuvuosi: 2011-12

Lukuvuoden alkamispäivämäärä: 01.08.2011

## 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  
 817606S: Project II (Project in Distributed Global Context), 11 op  
 813621S: Research Methods, 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  
 817603S: System Design Methods for Information Systems, 5 op

## Optional Studies (vähintään 25 op)

Optional studies must be at least 25 ECTS credit points.

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  
 812651S: ICT and Behaviour Change, 5 op  
 812335A: Interaction Design, 4 op  
 815309A: Real Time Distributed Software Development, 6 op  
 815310A: Software Production and Maintenance, 4 op  
 815311A: Software Quality and Testing, 5 op  
 812671S: User Experience (UX) and Usability Evaluation, 5 op

## Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

300002M: Advanced Information Skills, 1 op  
 812650S: Advanced Topics in Human-Centred Design, 5 op  
 817607S: Advanced Topics on Information Systems and Software Engineering, 8 op  
 813618S: Application/Software/Service Package-based Information Systems Development, 5 op  
 811336A: Collective capabilities and information processing, 1 - 5 op  
 814602S: Design and Analysis of Computer Algorithms, 5 op  
 816663S: Designing Secure Systems and Software, 5 op  
 817608S: Digital Service Innovation and Design, 5 op

### *Compulsory*

817608S-01: Digital Service Innovation and Design, exercise work, 0 op  
 817608S-02: Digital Service Innovation and Design, exam, 0 op  
 811600S: Emerging Trends in Software Engineering, 5 op  
 811601S: Emerging Trends in Software Testing, 5 op  
 813614S: Information Processing and Collective Capabilities, 1 - 4 op  
 811168P-02: Information Security, exam, 0 op  
 811168P-01: Information Security, exercise work, 0 op  
 813622S: Information Systems Evaluation, 5 op  
 811359A: Mobile Systems Programming, 6 op  
 813606S: Pro gradu thesis, 30 - 35 op  
 813605S: Pro gradu thesis (minor subject), 21 op  
 814660S: Program Correctness, 5 op  
 813630S: Software Business Development, 5 op

*Compulsory*

813630S-01: Software Business Development, exercise work, 0 op

813630S-02: Software Business Development, exam, 0 op

817603S-01: System Design Methods for Information Systems, exercise work, 0 op

817603S-02: Systems Design Methods for Information Systems, exam, 0 op

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

813352A: Usability Testing, 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:**

3 ECTS

**Language of instruction:**

Finnish

**Timing:**

1st year, period 1

**Learning outcomes:**

Objective: The purpose of the course is to lower the starting threshold for academic studies in the University of Oulu and to create basis for purposeful study planning thus for successful studies.

Learning Outcomes: After passing the course a student

1. knows the actions and services of the most important units, organizations and societies from the viewpoint of his /her studies,
2. recognizes the characteristics of the university level studies, own curriculum and the discipline of information processing science from the viewpoint of his / her studies,
3. is able to analyze the purpose of his/her studies and forthcoming study path,
4. is able to create and present his/her first own personal study plan (PSP) and
5. knows the city of Oulu and its services, the basis of IT field and the possibilities for student influence.

**Contents:**

1. Common occasions and lectures, 2. Small group activities, 3. PSP process, 4. Science library Tellus and Oula-database, 5. Exercises for the basic student software.

**Learning activities and teaching methods:**

Common occasions and lectures 25 h, small group activities 15 h, exercises 4 h, PSP creation and feedback conversation 8 h, independent personal work 25 h.

**Target group:**

1st year

**Recommended optional programme components:**

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**Recommended or required reading:**

Lecture materials, www-pages, study guides, brochures and forms.

**Assessment methods and criteria:**

Active participations in lectures, common occasions, exercises and small group activities. PSP display for the study counselor.

**Grading:**

Approved / failed.

**Person responsible:**

Amanuenses.

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

**Voimassaolo:** 01.08.1995 -

**Opiskelumuoto:** Language and Communication Studies

**Laji:** Course

**Vastuuyksikkö:** Language Centre

**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 most degree programmes. 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:**

Both English and Finnish are used.

**Timing:**

Biological Sciences: 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:**

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 will be able to find and take advantage of useful study materials available on the Internet in order to develop their own language learning strategies, which will enhance their academic English. Students show their awareness and their own responsibility by reflecting on their achievements in a study journal.

**Learning outcomes:** By completing the tasks of the course, students will

- have acquired effective vocabulary learning techniques by being able to distinguish parts of words to infer meanings
- expand their academic vocabulary by using Internet resources such as on-line dictionaries
- understand and be able to construct basic grammatical structures used in formal written English
- be able to utilize text structure and cohesion markers when reading academic texts
- 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

**Learning activities and teaching methods:**

The course is carried out in multi-mode, with instruction and student tasks both in class and in the Optima learning environment.

**Target group:**

1st year students of Biology, Chemistry, Geology, Information Processing Science, Physics, and Mathematics.

**Recommended or required reading:**

Set books for substance studies; journal articles in print and on-line. Further information will be given in the first lesson.

**Assessment methods and criteria:**

Active and regular participation in classroom sessions, completing the learning tasks (in class and Optima Learning Environment ) including the study journal. These are prerequisites for participation in the end of term examination. Exemptions from the examination can be given for excellent work during the course.

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.

**Grading:**

Pass/Fail

**Person responsible:**

Aila Syrjäkari-Roberts

**Other information:**

**Course registration:** Registration for the autumn term will take place from 12.00, 5th September to 12.00, 12th September in [WebOodi](#). The spring term registration will take place from 12.00, 1st December to 12.00, 9th January in [WebOodi](#).

**Examinations:**

**Autumn term end of course examination** will take place on Friday, 9th December, at 8.30 - 10.30 in lecture theatre LX. The registration for the examination will take place from 8.00, 1st December to 12.00, 8th December in [WebOodi](#).

**Spring term end of course examination** will take place on Friday, 4th May, at 8.30 - 10.30 in lecture theatre LX. The registration for the examination will take place from 8.00, 25th April to 12.00, 2nd May in [WebOodi](#).

**Resit examinations:** Two resit examinations are allowed on the dates set by the language centre (language centre [retake examination days](#)).

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

**Voimassaolo:** 01.08.1995 -

**Opiskelumuoto:** Language and Communication Studies

**Laji:** Course

**Vastuuyksikkö:** Language Centre

**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 for [Speaking](#) , [Listening](#) , [Writing](#)

**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

Geosciences : 2nd year spring term

Information Processing Science : 2nd year autumn term

Mathematical Sciences : 2nd year spring term

Physical Sciences : 2nd year autumn term

**Learning outcomes:**

The aim of this course is to develop students' oral/aural fluency in a range of general, scientific and academic communication situations.

Skills in pronunciation, listening and speaking are practised in the course.

**Learning outcomes:** By the end of the course, you are expected to have:

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

4. 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.

**Recommended or required reading:**

Course materials will be provided by the teacher and a copy fee will be charged.

**Assessment methods and criteria:**

*Pass / fail.* Assessment is based on regular attendance, active participation in all lessons and the successful completion of all homework tasks.

**Alternative method of course completion:** An optional exemption test is offered twice per year. See [exemption exam details and schedule](#). The student can only participate in the exemption exam once.

**Person responsible:**

Jolene Gear

**901004Y: Swedish, 2 - 3 op**

**Voimassaolo:** 01.08.1995 -

**Opiskelumuoto:** Language and Communication Studies

**Laji:** Course

**Vastuuyksikkö:** Language Centre

**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

Ei opintojaksokuvauksia.

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

**Voimassaolo:** 01.08.1995 -

**Opiskelumuoto:** Language and Communication Studies

**Laji:** Course

**Vastuuyksikkö:** Language Centre

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

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

**811108P: Basics of Project Work and Management, 3 op**

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Kokkonieni, Jouni Kalevi

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

811366A	Project Work	10.0 op
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**ECTS Credits:**

3 ects

**Language of instruction:**

Finnish

**Timing:****Timing:** 3<sup>rd</sup> year, autumn semester, period 1**Learning outcomes:**

**Objectives:** The course develops the necessary skills for various critical roles in software production projects. A wide range of project types is considered, including plan-driven and agile software development, along with their typical stages, contracts and plans, as well as project manager duties. The themes discussed at lectures are then considered in hands-on workshops.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures, exercises, assignment and seminars 80h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Compulsory prerequisites: Introduction to Programming (811122P) and Practice work (811176P), Object-oriented Programming and practise work (812347A), Data Structures and Algorithms (811312A), Introduction to Information Systems Design (811170P), Basics of Databases (811380A) and Software Engineering (811335A). Prerequisite for course Project 1 (811365A).

**Recommended or required reading:**

**Course materials:** R. Pressman, Software Engineering: A Practitioner's Approach. McGraw-Hill, 2005.

**Assessment methods and criteria:**

**Assessment methods :** Lectures and workshops are obligatory, including workshop reports.

**Grading:**

**Grading:** pass/fail

**Person responsible:**

Jouni Kokkonen

**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

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 1<sup>st</sup> year, spring semester, period 3

**Learning outcomes:**

**Objective:** The course gives an overview of the programme's running platform that consists of computer hardware, network interfaces and device drivers. The approach of the course is abstract thinking. The components of the

complex running platform are perceived as layered system architecture. The course teaches the structure of architecture layers, mechanisms, running semantics and tasks, and determination and compatibility of critical properties (performance, security, power consumption). The main focus of the course is on PC computer architecture, but laptops and mobile computers are also examined.

**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 the first job as a professional.

**Contents:**

**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

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 40h, home exercises 15h, laboratory exercises 15h, examination 60h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

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**Recommended or required reading:**

**Study materials:**

- 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

**Grading:**

1-5

**Person responsible:**

Petri Pulli

**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

**Language of instruction:**

finnish

**Person responsible:**

Juha Kortelainen

**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

**Language of instruction:**

Finnish

**Timing:****Ajoitus:** 1. vsk, syyslukukausi, periodi 2**Target group:****Recommended or required reading:****Grading:**

1-5

**Person responsible:**

Tonja Molin-Juustila

**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

**Language of instruction:**

Finnish

**Timing:****Timing:** 1st year, spring semester, period 4**Learning outcomes:****Objective:** To present the basic concepts, mechanisms and strategies of modern information security from the point of view of an organisation (and thus from the standpoint of information security management). To recognise the security problems of the Internet and to understand the dangers connected with surfing and doing business on the web. To supervise, practise and manage the security systems of a personal computer (firewall structures, virus detection, secure email).**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 40h, exercises 30h, autonomous work about 60h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** mastering the material presented in the courses "Discrete Structures" and "Internet and Computer Networks"

**Recommended or required reading:**

**Opiskelumateriaali:** luentokalvot (noin 250 kpl), luentomoniste (noin 100 sivua), oppikirja: M. Whitman ja H. Mattord, *Principles of Information Security 2nd ed.*, Thomson Course Technology, Boston, 2005. ISBN 0-619-21625-5

**Assessment methods and criteria:**

**Assessment methods:** passing by either partial exams (3 exams) or by a final exam

**Grading:**

1-5

**Person responsible:**

Mikko Siponen, Juha Kortelainen

## 030005P: Information Skills, 1 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Technology

**Arvostelu:** 1 - 5, pass, fail

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

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

030004P Introduction to Information Retrieval 0.0 op

**ECTS Credits:**

1 credit.

**Language of instruction:**

Finnish/English

**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.

**Learning activities and teaching methods:**

The course involves training sessions (8h), web-based learning materials, exercises in the Optima learning environment and a final assignment on a topic of the student's own choice.

**Recommended or required reading:**

Web-based learning material from Toolbox of Research (<https://wiki oulu.fi/display/tor/1.1+Finding+scientific+information>)

**Assessment methods and criteria:**

Passing the course requires participation in the training sessions and successful completion of the course assignments.

**Grading:**

pass/fail

**Person responsible:**

Science and Technology Library Tellus, tellustieto (at) oulu.fi <http://www.kirjasto oulu.fi/index.php?id=738>

**Other information:**

<http://www.kirjasto oulu.fi/index.php?id=738>

**810136P: Introduction to Information Processing Sciences, 5 op**

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Juhani Warsta

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

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

**ECTS Credits:**

5 ECTS

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 1st year of Bachelor studies, autumn semester, periods 1–2

**Learning outcomes:**

**Objective:** The course focuses on the key concepts of the information society, information technology and development prospects as well as on the main lines of computer science teaching and research.

**Learning outcomes:** Students are able to complete information searches belonging to subject areas related to the course, they are able to analyse the information they have found and are able to write short reports.

**Contents:**

**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 presentations.

**Learning activities and teaching methods:**

**Model of delivery:** Lectures 26h, exercise work 30h, the self-study 55h and final exam 20h. The course uses a web based learning environment for sharing information and exercises in support of reading.

**Target group:**

**Target audience:** Bachelor level students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** None

**Recommended or required reading:**

**Study materials:** A list of study materials will be available at the course website

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures, course assignments, and exam

**Grading:**

**Arvostelu:** Hylätty, 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:** Hekkala, Riitta Sisko

**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

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 1<sup>st</sup> year, autumn semester, period 1

**Learning outcomes:**

**Objective:** The purpose of the course is to provide a holistic view of information systems development. Students who have passed the course should have preliminary skills to model the organisational context as well as the information content and functionality of an information system. Furthermore, the students should know the major areas of the technical design, major process models of information systems development, basic requirements of construction, the basics of information systems implementation, and the basics of information systems evaluation.

**Learning Outcomes:** After completing the course, a student can:

- Apply workflow models, context diagrams and use cases for modelling the organisational context of an information system;
  - Apply ER diagrams, class diagrams, event lists, use cases, dataflow fragments, combined dataflow diagrams and user interface sketches to model the information content and functionality of an information system;
  - Understand the major areas of technical design of an information system, major process models of information systems development, basics of requirements construction, basics of information systems implementation, and basics of information systems evaluation.

**Contents:**

**Contents:**

1. Introduction to information systems development
2. Information system and its modelling at the level of the organisational context
3. Information content and functionality of an information system: a process modelling view
4. Information content and functionality of an information system: an information modelling view
5. Information content and functionality of an information system: a user interface view
6. Information systems at the technical level: Part 1
7. Information systems at the technical level: Part 2
8. Process models of information systems development
9. Requirements construction
10. Implementation and evaluation of information systems

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 10 x 3h, exercises 7 x 3h, mandatory group work, examination 4h, independent work 104h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** 810136P "Introduction to Information Processing Sciences", 811171P "Humans as Users and Developers of Information Technology"

**Recommended or required reading:**

**Study materials:** Primarily 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, 5th edition

**Assessment methods and criteria:**

**Assessment methods:** Exam + mandatory exercise work

**Grading:**

**Grading:** Exam: 1–5, exercise work: passed

**Person responsible:**

Riitta Hekkala

## 811122P: Introduction to Programming, 5 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Ilkka Räsänen

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay811122P Introduction to Programming (OPEN UNI) 5.0 op

**ECTS Credits:**

5 ECTS

**Language of instruction:**

Finnish

**Timing:**

1st year, period 1

**Learning outcomes:**

**Objective:** Student can systematically design, accomplish and test simple programs using C-language as a target language.

**Learning outcomes:** After the course, the student:

- Understands the importance of design in programming;
- Can design and implement modular programs;
- Understands the principles of control structures and can exploit them;
- Understands the meaning on array constructions and can exploit them;
- Understands the meaning of pointers and can exploit them;
- Understands the meaning of data structures and can exploit them;
- Can manipulate text files programmatically.

**Contents:**

**Contents:**

- Software design method (waterfall)
- Problem solving
- Stepwise refinement
- Control structures
- Modular programming, calling modules, communication between modules
- Data types
- Arrays
- Pointers
- Character strings
- Data structures
- File processing

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures and exercises

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

-

**Recommended or required reading:****Study materials:** <http://www.tol.oulu.fi/users/ilkka.rasanen/johdanto.html>

Course book: Datel, Datel: C HOW TO PROGRAM; Pearson Education Inc. 2007

**Assessment methods and criteria:****Assessment methods:** two ways : 1. Final exam & exercise points; and 2. Weekly exams & exercise points**Grading:**

1-5

**Person responsible:**

Ilkka Räsänen

**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

**Language of instruction:**

Finnish

**Timing:**

1st year, period 4

**Learning outcomes:****Objective:** The course covers the software business from three different perspectives: business, business logic and the software company's own activities. Course subject matters include: The history of the software business, software industry structure and clusters, the field of software used in business models, networking and outsourcing, the software company's growth and development, software marketing, and sales and the software company's internationalisation.**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:****Contents:** More detail on the course web site**Learning activities and teaching methods:****Mode of delivery:** Lectures 30h, exercises 20h, independent work 63.5h and examination 20h**Target group:****Target group:** Bachelor level students, compulsory**Recommended optional programme components:**

-

**Recommended or required reading:****Study materials:** Refer to course website**Assessment methods and criteria:**

Examination

**Grading:**

Fail, 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

**Timing:**

**Timing:** 1<sup>st</sup> year, autumn semester, period 2

**Learning outcomes:**

**Objective:** To deepen the understanding of design, implementation and testing in programming

**Learning Outcomes:** After completing the course, the student can systematically design, implement and test simple programs using C-language as a target language.

**Contents:**

**Contents:**

- Problem analysis
- Design
- Implementation
- Documentation

**Learning activities and teaching methods:**

**Mode of delivery:** Independent work 50h, 2 workshop 4h & web tutoring

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** 811122P "Introduction to Programming"

**Recommended or required reading:**

**Study materials:** Introduction to programming lecture material

**Assessment methods and criteria:**

**Assessment methods:** Accomplish programming assignment

**Grading:**

**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

**Language of instruction:**

**Language of instruction:** Finnish/English

**Timing:**

**Timing:** 3<sup>rd</sup> year, timing is free

**Learning outcomes:**

**Objectives** The aim is to practice the entire process: planning, data collection, analysis, reporting.

**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.

After completing the course, students will be able to produce the above within a limited subject area guided by research.

**Contents:**

**Contents:** Each student will be guided based on the research literature.

**Learning activities and teaching methods:**

**Mode of delivery:** 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:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** 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 thesis. Written final test conducted on the research topic.

**Recommended or required reading:**

**Study materials:** The student's self-written material, institution and the instructor advice and scientific research and support material. Written work, compliance with the institution's formal guidelines.

**Assessment methods and criteria:**

**Assessment methods:** Course requires a Bachelor's thesis preparation. In addition, the course may be included in the pilot, as determined by scientific research-related tasks.

**Grading:**

1-5

**Person responsible:**

Kari Kuutti

## 811380A: Basics of Databases, 7 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** lisakka, 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

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 2<sup>nd</sup> year, autumn semester, period 2, and spring semester, period 3

**Learning outcomes:**

**Objective:** The course does relational databases, conceptual modelling of databases, as well as XML and object databases.

**Learning Outcomes:** After completing the course students are able to model conceptually, can take into account the design of databases and information systems, and can manage relational, XML, and Object-Oriented databases.

**Contents:**

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

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures (45h), compulsory exercises (40h) and assignments (10h).

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Course 812346A "Object Oriented Analysis and Design" or knowledge about object oriented class models.

**Recommended or required reading:**

**Study materials:** Silberschatz, Korth & Sudarshan: Database system concepts

**Assessment methods and criteria:**

**Assessment methods:** To be announced in course web pages.

**Grading:**

1-5

**Person responsible:**

Juha Iisakka

**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:** 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

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 2<sup>nd</sup> year, autumn semester, period 1

**Learning outcomes:**

**Objective:** A course provides basic user interface design and usability knowledge.

**Learning Outcomes:** After completing the course, a student is able to define the basic concepts of user interface design, to introduce the basic process steps and the most common design and evaluation methods.

**Contents:**

**Contents:** Terms, user interface types, interaction models and context, elements and navigation related to common windowed systems, interaction design basics, process, design rules, evaluation techniques, universal design and user support.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, controlled exercises or the assignment 65h, preparing for the final exam and final exam ~50h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Course "Humans as Users and Developers of Information Technology" (811171P) or similar knowledge.

**Recommended or required reading:**

**Study materials:** Dix et al. (2004, 3. edition) Human-Computer Interaction or related course books and materials.

**Assessment methods and criteria:****Assessment methods:** assignment 50%, final exam 50%**Grading:**

1-5

**Person responsible:**

Anna-Liisa Syrjänen

**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

**Language of instruction:**

Finnish

**Timing:****Timing:** 3<sup>rd</sup> year, spring semester, period 3**Learning outcomes:****Objective:** The course gives basic knowledge and skills for collecting, managing, analysing and presenting quantitative statistical data in information processing sciences. The course also provides the basis for further studies of quantitative research methods.**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:****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.**Learning activities and teaching methods:****Mode of delivery:** Lectures 20h, exercises 20h, independent work 60h**Target group:****Target group:** Bachelor level students, compulsory**Recommended optional programme components:**

-

**Recommended or required reading:****Study materials:** 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:****Assessment methods:** Exam/lecture diary and exercises**Grading:**

1-5

**Person responsible:**

Jouni Markkula

**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

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ects

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Bachelor studies, spring semester, periods 3 & 4

**Learning outcomes:**

**Objective:** The course aims at providing basic information and skills in modelling and developing business- and work-processes, as well as information about some basic theories in this field.

**Learning Outcomes:** After completing the course, students are able to model and develop business- and work-processes, as well as use computer-based process tools. The students understand business process change on the enterprise level, business process level, as well as the implementation level.

**Contents:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** The overall workload for each student in this course is 133.5 hours. The course will be arranged for the first time in 2011/2012, and a detailed plan of the course is not yet available. Therefore, the distribution of this 133.5-hour workload amongst the different parts of the course will be announced on the course webpage before the course starts.

**Target group:**

**Target group:** Bachelor level students (compulsory)

**Recommended optional programme components:**

-

**Recommended or required reading:**

**Study materials:** A list of study materials will be available on the course website

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam

**Grading:**

**Grading:** 1–5

**Person responsible:**

Karin Väyrynen

## 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:** Martti Luodonpää

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

521144A Algorithms and Data Structures 6.0 op

**ECTS Credits:**

5 ects

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 2<sup>nd</sup> year, autumn semester, period 2

**Learning outcomes:**

**Objective:** The course covers basic data structures and related algorithms as well as algorithm design paradigms and algorithm analysis.

**Learning Outcomes:** After completing the course, a student:

- Can draw on the problem of suitable data structures and algorithms, and can justify the data structure or algorithm and selection of the application;
- Is able to analyse simple algorithms, i.e., to prove the accuracy of the algorithm and evaluate the algorithm performance in relation to the size of the feed;
- Manages the concept of the algorithm and discusses sorting algorithm complexity classes;
- Manages the data structure of the concept, basic data structures and the concept of the network and core network algorithms.

**Contents:**

**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 structures, Hash tables, Binary search trees, Graphs and their algorithms.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 40h, exercises 24h, independent work 65h.

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Mastery of subject matter of the course "Discrete Structures" is required.

**Recommended or required reading:**

**Study materials:** Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, Second 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:**

**Assessment methods:** Exam

**Grading:**

1-5

**Person responsible:**

Martti Luodonpää

**812304A: Information Systems in Organizations, 6 op**

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 ECTS

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 2<sup>nd</sup> year, spring semester, period 4

**Learning outcomes:**

**Objective:** The course gives a broad overview of information systems in contemporary organisations.

**Learning Outcomes:** After completing the course the student is

- Able to explain the importance of information systems for organisations;
- Able to define the conditions for success of information operations in the organisation;
- Able to identify the main features of information systems development.

**Contents:**

**Contents:** Fundamentals of organisations, structure and functioning, digital organisation, basic types of information systems, the role of information systems in organisations, the interplay between information systems and organisations, the role of information systems in organisational leadership and decision making, the formation and mastering of organisational information, enterprise resource planning systems, the renewal of organisations with information systems, the economic aspects of information systems.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 27h, self-governing reading of course material 110h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Basics of information systems planning

**Recommended or required reading:**

**Study materials:**

- Laudon, K.C and Laudon, J.P., Management Information Systems, Prentice-Hall, Upper Saddle River, NJ, Sixth edition, 2000, pp. 2–159, 330–367, 398–495 or Seventh edition, 2002, pp. 2–101, 301–429, or Ninth edition 2006, pp. 1–111, 378–506, 534–569, or Tenth edition, pp. 3–119, 428–523, 552–587.
- Handy, C., Understanding Organizations, Penguin Books, Fourth edition, 1999, pp. 13–179.
- Mintzberg, H., Structure in Fives, Designing effective organizations, Prentice-Hall, Englewood Cliffs, 1983, pp. 1–23.
- Nonaka, I. & Takeuchi, H., The Knowledge Creating Company, Oxford University Press, New York, 1995, pp. 56–94, 124–171.

**Assessment methods and criteria:**

**Assessment methods:** Exam

**Grading:**

1-5

**Person responsible:**

**Responsible person:** to be defined later

## 812334A: Information systems planning, 6 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Seppo Pahlila

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 ECTS

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 3<sup>rd</sup> year, spring semester, periods 3–4

**Learning outcomes:**

**Objective:** The course deepens the know-how gained in the course Basics of Information Systems Planning. The emphasis is on how to develop an information system from the point of view of the user and organisational function.

**Learning Outcomes:** After completing the course students are able to explain information systems planning and operation of the link between developments, and can apply their development-oriented information systems design methodology.

**Contents:**

**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 before software design. The exercise work is carried out using a chosen information systems design methodology (currently Contextual Design).

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 24h, exercises 24h, course assignment 90h, seminars 12h, individual learning diary 10h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** 811170P "Introduction to Information Systems Planning" and 812346A "Object Oriented Analysis and Design".

**Recommended or required reading:**

**Study materials:** Beyer, H. Holtzblatt, K. (1998): Contextual Design: Defining Customer-Centred Systems. San Francisco: Morgan Kaufmann Publishers, Inc

**Assessment methods and criteria:**

**Assessment methods:** 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. With good groundwork, the course can be passed via individual work.

**Grading:**

1-5

**Person responsible:**

Seppo Pahnla

## 811338A: Internet and Computer Networks, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Kokkonen, Jouni Kalevi

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

5 ECTS

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 1<sup>st</sup> year, spring semester, period 3

**Learning outcomes:**

**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 those general principles along 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:**

**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 reference models
3. The functioning of the application layer, network application architectures, communicating processes, transport services
4. Classical network applications: electronic mail, file transfer, remote login, newsgroups
5. New applications on the Internet: DNS, World Wide Web and HTTP, content distribution
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 devices, wireless connections
10. The principles of network security, security in different layers of the network.

**Learning activities and teaching methods:**



**Mode of delivery:** Lectures 40h, exercises 30h, autonomous work about 60h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Preceding course "Discrete Structures"

**Recommended or required reading:**

**Study materials:** Lecture slides (about 250 slides), lecture notes (about 100 pages), text book: J. F. Kurose and K. W. Ross, *Computer Networking. A Top-Down Approach, Fifth Edition*, Pearson Education Inc., 2010. ISBN: 978-0-136548-3.

**Assessment methods and criteria:**

**Assessment methods:** either partial exams (3 exams) or by a final exam

**Grading:**

on the scale 1 - 5

**Person responsible:**

Jouni Kokkonen

## 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

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 3<sup>rd</sup> year, autumn semester, period 1 ja 2

**Learning outcomes:**

**Objective:** The course has a two-fold objective: to provide an overview of the importance of research in society and the positioning of universities, research institutes and enterprises; and, secondly, to develop the students' capacity for research work, mainly to identify the correct research and scientific publications to read and analyse. The B.Sc. course prepares for the Bachelor's thesis.

**Learning Outcomes:** After completing the course, students:

- Have an idea of the role of research in society and the university, and know the body of research within their own field of science;
- Know the basic elements of the research process for each output;
- Are able to explain the research process;
- Understand the importance of research in scientific publishing;
- Are able to assess the different channels of publication and are able to use at least two ways of assessing publishing quality – the quality of the publication and the appropriate number of references;
- Understand the importance of scientific argument, know the argument of structural elements and are able to analyse simple argument structures;
- Are aware of the role of empirical data in research, are able to apply some of the key data collection and analysis methods and are able to justify a choice among alternative approaches;
- Are able to comment on the research report;
- Are able to write queries and retrieve publications in the reference databases.

**Contents:**

**Contents:** General information about research, scientific publishing, scientific argumentation, methods for empirical data collection and analysis, information searching using scientific databases.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, exercises 80h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:****Prerequisites:** Preparation for candidate thesis**Recommended or required reading:****Study materials:** Lecture notes, exercise notes, scientific publications**Assessment methods and criteria:****Assessment methods:** Participation to lectures and exercises, evaluation of submitted results**Grading:**

1-5

**Person responsible:**

Raija Halonen

**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**Opettajat:** lisakka, Juha Veikko**Opintokohteen kielet:** Finnish**ECTS Credits:**

6 ECTS

**Language of instruction:**

Finnish

**Timing:****Ajoitus:** 1. vsk, kevätlukukausi, periodi 4**Learning outcomes:****Objective:** The course covers the principles of object orientation as well as object-oriented analysis, design modelling and modelling techniques.**Learning Outcomes:** After completing the course the student knows object-oriented analysis, design modelling, modelling techniques and design principles. Moreover, the student is able to analyse and design using these techniques.**Contents:****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.**Learning activities and teaching methods:****Mode of delivery:** Lectures 34h, compulsory exercises and assignments 30h, independent work 95h.**Target group:****Target group:** Bachelor level students, compulsory**Recommended optional programme components:****Prerequisites:** Basic knowledge of programming and information systems analysis and design**Recommended or required reading:****Study materials:** Bennet, McRobb & Farmer: Object-oriented systems analysis and design, Using UML**Assessment methods and criteria:****Assessment methods:** Refer to course web pages**Grading:**

1-5

**Person responsible:**

Juha lisakka

**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

**Language of instruction:**

Finnish

**Timing:**

**Ajoitus:** 2. vsk, syyslukukausi, periodit 1+2

**Learning outcomes:**

**Objective:** The course demonstrate the concepts and benefits of object-orientation, such as improved structure, quality and maintainability of software.

**Learning Outcomes:** After completing the course, a student:

- Can understand the paradigm of the general objectives and techniques, as well as object-oriented programming concepts, the importance of practice and their implementation;
- Is able to apply design patterns with the solutions and understands the creatures, the interface/implementation approach and message passing principles and their importance;
- Is able to apply the inheritance and composition of the diversity, and can remember the Model-View-Controller model of software implementation principles.

**Contents:**

**Contents:**

1. Object-orientation
2. C++ language
3. Composition, inheritance and polymorphism
4. Design patterns and Model-View-Controller
5. Generics and object-oriented data structures

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 32h, laboratory exercises 24h, weekly examination and independent work 110h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Courses "Introduction to Programming", "Introduction to Programming Assignment", "Object-oriented Analysis and Design" or similar knowledge

**Recommended or required reading:**

**Study materials:**

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

**Assessment methods and criteria:**

**Assessment methods:** Weekly examination (preferred) or final exam + programming assignment

**Grading:**

1-5

**Person responsible:**

Ari Vesanen

## 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:** Lappalainen, Jouni Esko Antero

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

811366A Project Work 10.0 op

**ECTS Credits:**

7 ECTS

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 3<sup>rd</sup> year, autumn and spring semester, periods 2–4

**Learning outcomes:**

**Objectives:** The course integrates the contents of the previous subject matter courses in the degree programme. The implementation environments are defined by the project-specific task descriptions. These task descriptions include, but are not limited to, generic software, information system, digital media, mobile applications and game implementations. Task descriptions are received primarily from the local software companies or from the research project teams within the university departments.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** lectures 2h, practical project work 230h.

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Compulsory prerequisites:** Pakollinen edeltävyys: "Projektitoiminnan perusteet" (811108P) sekä seuraavat kurssit: Johdatus ohjelmointiin (811122P) ja harjoitustyö (811176P), Olio-ohjelmointi joko viikkotehtävillä tai harjoitustyöllä suoritettuna (812347A), Tietorakenteet ja algoritmit (811312A), Tietojärjestelmien suunnittelun perusteet (811170P), Tietokantojen perusteet ja harjoitustyö (811380A) ja Ohjelmistotekniikka (811335A).

**Recommended or required reading:**

**Study materials:** 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.

**Grading:**

pass / fail

**Person responsible:**

Jouni Lappalainen

## 811391A: Requirements Construction, 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

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 3<sup>rd</sup> year, autumn semester, period 2

**Learning outcomes:**

**Objectives:** Requirements elicitation, analysis and documentation techniques will be covered during this course. We will describe the concepts of problem domain and solution domain as characterising the different viewpoints to requirements. The role of requirements will be discussed in different project and software acquisition situations.

**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 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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 40h, weekly assignments and project assignment ~100h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** We assume the basic skills from the following courses: "Principles of Information System Design", "Object Oriented Analysis and Design", "Principles of Databases", "Software Engineering" and "Information System Design".

**Recommended or required reading:**

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

**Assessment methods and criteria:**

**Assessment methods:** Two ways of passing:

- 1) Active participation: weekly assignments and project assignment (only for Finnish speaking students)
- 2) Conventional exam

**Grading:**

**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 the scale 1–5.

**Person responsible:**

Samuli Saukkonen

## 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:** Juustila, Antti Juhani

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 ECTS

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 3<sup>rd</sup> year, spring semester, period 3

**Learning outcomes:**

**Objective:** The course is provided within the inter-university OSCu framework. The goal of the course is to provide software architecture concepts and methods. The focus of the architecture solutions is on object-oriented systems but general architecture styles, patterns and techniques are considered as well.

**Learning Outcomes:** After the course, the student is able to identify and analyse different software architecture solutions and understands the pros and cons of each solution from the perspective of building and executing the software, as well as from the viewpoints of quality and maintainability. The student is able to describe software architecture solutions and the elements of such, including the interfaces between the elements, using UML. The student is able to create alternative architectural solutions based on the functional and non-functional requirements of the software, and evaluate the suitability of the solution regarding the purpose of the software. The student is able to identify the differences between the design of product/product family architectures with conventional software architectures.

**Contents:**

**Contents:** Software architecture foundations, architecture documenting, components and interfaces, dependencies, design patterns, styles, product line architectures, frameworks and architecture evaluation methods.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 30h, exercises 20h, assignment 90h and examination 20h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** General knowledge of software development, UML basics and general experience with object-oriented programming (included in courses: 811335A "Software engineering", 812346A "Object oriented analysis and design")

**Recommended or required reading:**

**Study materials:** K. Koskimies, T. Mikkonen: Ohjelmistoarkkitehtuurit. Talentum 2005; L. Bass, R. Clements, R. Kazman: Software Architecture in Practice. Addison-Wesley 2003; Web pages at <http://www.tol.oulu.fi/users/lech.krzanik/cbsd.htm>

**Assessment methods and criteria:**

**Assessment methods:** Lectures are not obligatory though strongly recommended, other parts are obligatory, evaluated, and have the following pass thresholds: weekly exercises: 40% tasks; assignment stages 1–3: pass/fail; examination: 15 points.

**Grading:**

**Grading:** There's no compulsory presence required in the lectures. For other parts, presence is required and performance is scored. Limits to pass: 40% of weekly exercises; exercise work is acceptable; minimum of 15 points acquired from the examination

**Person responsible:**

Antti Juustila

## 811335A: Software engineering, 6 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tervonen, Ilkka Tapio

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 ECTS

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 2<sup>nd</sup> year, spring semester, period 3

**Learning outcomes:**

**Objective:** The course introduces Software Engineering as a systematic, disciplined and quantifiable approach to the development and maintenance of software. The student applies the software design methods and software engineering practices in the development of a tiny software application.

**Learning Outcomes:** After completing the course, a student is able to explain various aspects of software engineering areas such as process models, requirement specification, analysis and design methods, quality management and project management, their importance and know how to use them for small-scale task solving. Is familiar with software engineering practices and activities (review, testing, software product management, risk management, project management) and know how to use them in software development at different levels. Can explain the maintenance and redesign of software evolution and its importance.

**Contents:**

**Contents:** Software process, software requirements, software design methods, software engineering practices, software quality management, software process management

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 34h, study group working, essay, exercises 27h, home work 30h, assignment 30h, examination 30h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Prerequisites:** Course "Introduction to Information Systems Design" and "Object Oriented Analysis and Design" or similar knowledge

**Recommended or required reading:**

**Study materials:** Pressman R., Software Engineering, A Practitioner's Approach, 7<sup>th</sup> edition, McGraw-Hill, 2010, lecture material <http://www.tol.oulu.fi/users/ilkka.tervonen/OTE.html>

**Assessment methods and criteria:**

**Assessment methods:** Exam and assignment, exam can be replaced by study group work or essay

**Grading:**

1-5

**Person responsible:**

Ilkka Tervonen

## 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

**Language of instruction:**

Finnish

**Timing:**

**Timing:** 3<sup>rd</sup> year, autumn semester, periods 1 & 2

**Learning outcomes:**

**Course objectives:** The course implements into practice the skills and knowledge gained during previous courses, such as (object-oriented) programming, database usage from program code and user interface design. The objective is to integrate previous theoretical studies into applied practice, for which the student will design and implement a database-connected application that has a graphical user interface of good usability.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Exercise 33h, coursework 75h, independent study 25h

**Target group:**

**Target group:** Bachelor level students, compulsory

**Recommended optional programme components:**

**Compulsory prerequisites:** Knowledge and skills of the course "Basics of Databases" and fundamentals of user interface design. In addition, the knowledge and skills of object-oriented programming are needed.

**Recommended or required reading:**

**Study materials:** 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:**

**Assessment methods:** the student must submit coursework that fulfils the given requirements (defined during the course).

**Grading:**

**Grading:** 1–5 / fail

**Person responsible:**

Jouni Lappalainen, Mikko Rajanen

## 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

**Timing:**

**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.

## 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

**Opintokohteen kielet:** Finnish

**Required proficiency level:**

**ECTS Credits:**

2 ECTS

**Language of instruction:**

Finnish / English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn and spring semester, periods 1–4

**Learning outcomes:**

**Objectives:** The course integrates the whole curriculum. From the student viewpoint the course supports the planning, execution and evaluation of their own graduate thesis work.



**Learning Outcomes:** By completing this course the student can plan scientific study and understands the approach the reviewers use to evaluate a thesis.

**Contents:**

**Contents:** See "assessment methods" below

**Learning activities and teaching methods:**

Mode of delivery: Planning and presenting the student's own research. Listening to peer students' research plans and research reports.

**Target group:**

**Target group:** all Master's level students and GS <sup>3</sup>D students, compulsory

**Recommended optional programme components:**

**Prerequisites:** "Master's thesis" course.

**Recommended or required reading:**

**Study Material:** Guidelines to producing a master's thesis.

**Assessment methods and criteria:**

**Assessment Methods:** 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.

**Grading:**

pass/no pass

**Person responsible:**

Jouni Similä

## 812631S: Project II, 14 op

**Voimassaolo:** - 31.07.2014

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tonja Molin-Juustila

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

812610S Project seminar 4.0 op

**ECTS Credits:**

14 ECTS

**Language of instruction:**

Finnish / English

**Timing:**

1<sup>st</sup> year of Master's studies for three periods: spring semester, periods 3 & 4 and 2<sup>nd</sup> year, autumn semester, period 1 (recommended). Or 2<sup>nd</sup> year, autumn semester, periods 1 & 2 and spring semester, period 3.

**Learning outcomes:**

This course integrates the major advanced special studies of our curriculum. The aim is to demonstrate the student's ability to work on a challenging ICT project. Students will learn to acquire and apply new knowledge in the topic of the project, as well as to analyse and report the created new knowledge to peer student groups. Also, the students will demonstrate their skills to conduct a project in a professional way.

By completing this course a student can act as an independent professional member of an ICT project. The skills learnt are in two parts: expertise in the project topic and professionalism in the project work.

**As an expert in the topic area the student:**

- Can search research articles and other up to date information on the topic at hand;
- Can apply this information in his/her project work;
- Can evaluate the results of the project and the practical experiences gained during the project against the literature and research;
- Can disseminate the results and experiences in credible way to peer students both by a written report and orally.

**As a professional in conducting a project in managed way the student:**

- Can plan the project;
- Can manage the progress of the project with the steering group/project team organisation (reporting the progress and results of the project, the use of the steering group in decision making and problem resolution);
- Can follow the progress of the project in real time within the project team.
- Can work as a responsible project team member.
- Can produce realistic outcome in relation to project resources.

**Contents:**

Starting lecture, where the steps of carrying out the course will be described together with allocating the project assignments to project teams. The project work will take about two periods (one semester) followed by the third period for analysis, reporting and presentation of the expertise on the topic.

**Learning activities and teaching methods:**

Project work 300h and seminar ca. 70h per student. Attendance at the presentation sessions (1–2 days) is mandatory. International exchange students have an option to participate only in the project part of the course (300h). In this case the ECTS credits will be 11. See Project in Distributed Global Context (817606S).

**Target group:**

Master's level students, compulsory

**Recommended optional programme components:**

Mandatory: B.Sc. degree or other equivalent degree. Students enrolling directly to the master's programme should take the Basics of Project Work and Management (811108P) course first.

**Recommended or required reading:**

Unique project material to be collected by the customer of the project and/or material to be researched by the project team.

**Assessment methods and criteria:**

Project management skills will be reported in a project portfolio. Expertise in the topic area will be reported in the seminar report. Seminar presentation will also be evaluated. Detailed criteria for evaluation will be given at the starting lecture.

**Grading:**

Every member of a project team will get the same grade. The grade (scale 1–5) will be based on:

- Project management skills (45%)
- Expertise in topic area (45%)
- Oral presentation (10%)

**Person responsible:**

Tonja Molin-Juustila

## 813621S: Research Methods, 5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tero Vartiainen

**Opintokohteen kielet:** English

**Leikkaavuudet:**

521146S    Research Methods in Computer Science    5.0 op

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, period 2 and spring semester, period 3

**Learning outcomes:**

**Objective:** The course gives an introduction to general scientific research principles and the empirical research methodology of computer science, information systems and software engineering research. In the course, the three main research approaches applied in the field are presented: qualitative, quantitative and constructive research. These approaches are introduced with examples of more specific research methods. The course is especially intended for supporting Master's thesis research.

**Learning Outcomes:** After completing the course, the student knows the general principles of scientific research and the practices of scientific methodology. He/she can identify and describe the main research approaches and choose the appropriate one for his/her research problem. The student can apply basic research methods and search for more information for learning and applying new research methods. He/she is also able to evaluate the methodological quality of a research publication.

**Contents:**

**Contents:** Introduction to general scientific principles, inference and methodology, scientific research practices and quality of scientific publications, qualitative research approaches and selected research methods, quantitative research approaches and selected research methods, constructive research approaches and selected methods, requirements and examples of Master's theses.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 40h, exercises 30h and individual work 65h

**Target group:**

**Target group:** all Master's level and GS <sup>3</sup>D students, compulsory

**Recommended optional programme components:**

**Prerequisites:** B.Sc. degree or other equivalent degree.

**Recommended or required reading:**

**Study materials:** Lecture slides and specified literature

**Assessment methods and criteria:**

**Assessment methods:** Learning diaries/essays/exam and exercises

**Grading:**

Pass/fail

**Person responsible:**

Tero Vartiainen

## 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The focus of the course is in the software development environments and tools for embedded platforms, such as Android, MeeGo, and PIC32. In addition, the course covers memory and power management, the core services of the platform, and the utilisation of existing libraries, such as Qt.

**Learning Outcomes:** After completing the course, a student can use the essential software development tools of a selected embedded platform, and is able to work with them. 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:**

**Contents:** The course covers various embedded software development platforms, such as Android, MeeGo, and PIC32. 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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures and exercises about 30h, exercise work about 75h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Course "Real-time Distributed Software Development", C/C++ and/or Java programming skills or similar knowledge obtained from other courses.

**Recommended or required reading:**

**Study materials:** Course material, the documentation of selected technologies, and other related literature

**Assessment methods and criteria:**

**Assessment methods:** Exercise work

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Henrik Hedberg

**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

**Language of instruction:**

English

**Timing:**

2<sup>nd</sup> year of Master's studies, autumn semester, periods 1 & 2

**Learning outcomes:**

**Objective:** 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.

**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. The most popular OSS development projects are the Linux operating system, the OpenOffice suite, Mozilla/Firefox web browsers, and the Apache web server, but the size and type of projects vary. 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.

**Learning activities and teaching methods:**

Lectures and seminars about 30h, seminar preparation about 30h, seminar paper about 55h

**Target group:**

Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

Compulsory prerequisites are 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 or required reading:**

International articles covering the topic, empirical data from real OSS projects

**Assessment methods and criteria:**

Participation in seminars and a seminar paper

**Grading:**

1-5

**Person responsible:**

Henrik Hedberg

**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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, periods 1 & 2

**Learning outcomes:**

**Objective:** The course presents the theoretic background of real-time distributed systems, a model-based development methodology, and embedded, ubiquitous and mobile design examples.

**Learning Outcomes:** After completing the course, the student:

- Is able to analyse the characteristic 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:****Contents:**

Introduction:

- Characteristics of Real-Time Systems
- Timeliness
- Resource management
- Safety and Reliability
- Concurrency
- Security
- Multitasking, Interrupts
- Scheduling
- Hardware Interfaces

Characteristics of Distribution

- Centralised
- Client-server
- Clusters
- Cloud
- Peer-to-peer
- Ad hoc
- Concept of time
- Synchronisation
- Latency and jitter
- Quality of Service
- Service Discovery

- Networking primitives
- Networking frameworks

Real-Time UML Modelling Methodology

Real-Time Design Patterns

Design Examples: Embedded, Ubiquitous, Mobile, Web/Internet

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 45h, Design exercises 15h, Student projects 100h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module and GS<sup>3</sup>D students (optional)

**Recommended optional programme components:**

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

**Recommended or required reading:**

**Study materials:** Lecture notes based on reference books

- Douglass B.P. (1999) Doing Hard Time – Developing Real-Time Systems with UML – Objects, Frameworks. And Patterns. Addison-Wesley ISBN 0-201-49837-5. 749 p.
- Douglass B.P. (2007) Real-Time UML – Advances in the UML for Real-Time Systems. 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.
- Douglass B.P. (2009) Real-Time Agility – The Harmony/ESW Method for Real-Time and Embedded Systems Development. Addison-Wesley ISBN 0-321-54549-4. 522 p.
- Douglass B.P. (2007) Real-Time UML Workshop for Embedded Systems. Elsevier. ISBN 978-0-7506-7906-0. 408 p.
- Comer D.E (2009) Computer networks and Internets. 5th edition. Pearson – Prentice Hall. ISBN 978-0-13-504583-1. 600 p.

**Assessment methods and criteria:**

**Assessment methods:** Exam and project evaluation.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Petri Pulli

## 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<sup>st</sup> year of Master's studies; 2011-2012 spring semester, period 4; 2012 fall semester, period 1; in the following years the course will be implemented during the fall semester.

**Learning outcomes:**

After completing the course, the student

- Can define the key success factors of the 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 teaching 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 (article presentations and acting as opponents) for groups of 4 students. Study groups with groups of 8 students using case-based teaching method. Communication between exercise groups is done over the internet.

**Learning activities and teaching methods:**

Lectures and seminars involving all the students 30h and 30 h of reading (in English), study groups involving 8 students 20h, and exercises 50h. During the seminars a team of 4 students will present a selected research article and another team of 4 students will act as opponents. In the study groups a relevant teaching case from industry is discussed with the students. Each student will prepare a written analysis of the case before the discussion and a reflective analysis after the discussion. 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.

**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 (20%), lecture assignments (30%), study groups (10%), exercises (40%).

**Person responsible:**

Jouni Similä

**Working life cooperation:**

No

**Other information:**

Participation: The course is obligatory for GS<sup>3</sup>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

**Opintokohteen kielet:** English

**ECTS Credits:**

4 ECTS

**Language of instruction:**

Language of instruction: English

**Timing:**

Timing: 2<sup>nd</sup> year of Master's and GS<sup>3</sup>D studies, autumn semester, period 2

**Learning outcomes:**

**Objective:** The course gives an introduction to fundamental software engineering management, measurement and improvement concepts, methods and techniques in traditional, agile and lean development. The course covers both

principles as well as current trends in software processes. The teaching is supplemented with examples from practical software engineering.

**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:**

**Contents:** The course covers the most fundamental process centred software quality improvement approaches, methods and latest research results. The topics of the course include: software processes, quality and quality standards, organisational level quality, process quality, process improvement approaches, software process and product measurement, agile and lean methods, quality improvement in company level and practical examples from the software industry.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, study group working 25h, paper reading 25h, exercises 15h, report writing 20h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation but has been initially planned to be:

- 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

**Assessment methods and criteria:**

**Assessment methods:** Report evaluation

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Burak Turhan

## 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:** Oivo, Markku Tapani

**Opintokohteen kielet:** English

**ECTS Credits:**

7 ECTS

**Timing:**

**Timing:** 2<sup>nd</sup> year, autumn semester, periods 1+2

**Learning outcomes:**

**Objective:** Students will study the most essential and current research topics in software engineering (SWE). Students will also learn practices of scientific communication in the SWE community, the structure of research papers, to critically read research papers and to analyse the content of the papers and the research methods used in the papers. Students learn to present research papers and give constructive criticism in an academic environment. The knowledge and skills learned in this course will give a solid basis for starting a Master's thesis.

**Learning Outcomes:** After completing the course the student will have a good understanding of current research areas in SWE and the most important SWE research methods. The student 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:**

**Contents:** Research areas in software engineering, research methods

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures, assignments related to lectures, presentations, report. Lectures and seminars 42h, assignments 160h, report 60h. Total 185h.

**Target group:**

**Target group:** Master's level students in SE Oriented Module (compulsory), Master's level students in IS Oriented Module (optional) and GS <sup>3</sup>D students (compulsory, if not take course "Information Systems Theory")

**Recommended optional programme components:**

**Prerequisites:** B.Sc. or other equivalent degree

**Recommended or required reading:**

**Study materials:** Wohlin C., Runeson P., Höst M., Ohlsson M., Regnell B., Wesslen A., Experimentation in Software Engineering, Kluwer Academic Publishers, 2000, lecture material <http://www.tol.oulu.fi/index.php?id=998>

**Assessment methods and criteria:**

**Assessment methods:** Assignments related to lectures, report

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Markku Oivo

## 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

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 3

**Learning outcomes:**

**Objective:** The course gives an introduction to the core tasks of large-scale industrial software production and maintenance, focusing in software product line engineering, continuous integration/delivery and software maintenance.

**Learning Outcomes:** After completing the course, the student:

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

**Contents:**

**Contents:**

Product line engineering

- Product line variability
- Domain engineering
- Application engineering

Continuous integration/delivery

- Principles and practices of continuous delivery
- Ecosystem: automated testing, configuration management
- Implementing a deployment pipeline

Software maintenance

- Categories of maintenance
- Process of software maintenance

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 32h, study group working 32h, report writing 44h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering and software architectures

**Recommended or required reading:**

**Study materials:** This list is preliminary. An updated list of study materials can be found in the course web pages.

- Pohl, K., Böckle, G., van der Linden, F. Software Product Line Engineering. Foundations, Principles, and Techniques, Springer-Verlag, 2005
- 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
- Duvall P., Matyas S., Glover A., Continuous integration – Improving software quality and reducing risks, Addison-Wesley, 2007
- Humble J., Farley D., Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, Addison-Wesley, 2011
- [Gopalaswamy, R.](#), Ramesh, B., Software maintenance: effective practices for geographically distributed environments, Tata McGraw-Hill, 2006 - [Computers](#) - 456 pages

**Assessment methods and criteria:**

**Assessment methods:** Exam and assignment report, exam can be replaced by study group work

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Samuli Saukkonen

**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

**Opintokohteen kielet:** English

**Leikkaavuudet:**

ay815311A Software Quality and Testing (OPEN UNI) 5.0 op

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** The course gives an introduction to software quality, software quality assurance and quality techniques, such as review, inspection and testing at different testing levels. Quality techniques will be taught with appropriate tools. The course also introduces current principles in test-driven development and test automation and models for reviewing and testing process improvement.

**Learning Outcomes:** After completing the course, the student can explain different views on software quality and use quality models for its assessment. The student can analyse the benefits and obstacles of reviews, inspection and testing as a part of software engineering and defect removal techniques. The student can conduct the review as part of a review team and use an appropriate supporting tool. The student knows testing levels, strategies and techniques, can create test cases and conduct unit testing, test driven development, integration testing and acceptance testing with appropriate testing tools. The student can also explain the benefits and obstacles of test automation and knows models for the reviewing and testing of process improvement.

**Contents:**

**Contents:** Software quality and quality assurance. Software reviews and inspection. Software testing. Test-driven development. Test automation. Reviewing and testing process improvement.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 30h, study group working 25h, paper reading 25h, exercises 25h, report writing 30h

**Target group:**

**Target Group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation but has been initially planned to be:

- Galin D., "Software Quality Assurance: From theory to implementation", Addison-Wesley, 2004
- Mathur A.P., "Foundations of Software Testing", Prentice Hall, 2008
- Pezze M., Young M., "Software Testing and Analysis: Process, Principles and Techniques", John Wiley&Sons, 2008

**Assessment methods and criteria:**

**Assessment methods:** Report evaluation

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Burak Turhan

**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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 3

**Learning outcomes:**

**Objective:** This course addresses the development and anticipation of emerging information technologies and issues related to the ICT industry and user organisations. Special emphasis will be given to understanding the developments related to the World Wide Web. The course will discuss the impact of the current social web and the future web on organisations and the ICT industry on multiple levels such as individual, social, organisational, economic and cultural. A global perspective on these emerging technologies and issues will be adopted in this course. The course provides students with methods and tools to evaluate and analyse technical, conceptual and managerial issues as well as strategic implications of emerging technologies and issues. The course may also potentially discuss forecasting methodologies including monitoring, trend analysis and scenario construction.

**Learning Outcomes:** After completing the course, the student is able to:

- Analyse the on-going changes in 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 of leveraging the technology to improve intra and inter-organisational processes and enhance a firm's competitive position;
- Develop his/her skills for building careers and taking advantage of entrepreneurial opportunities through emerging technologies; and
- Categorise and compare factors that influence how relevant an emerging technology will be in the long run.

**Contents:**

**Contents:**

- Development trends of the ICT industry and technology convergence, in particular related to the world wide web.
- What are emerging technologies; what has their economic and other impact been to date; what is their potential impact; projections of future impact?
- The creation and transformation of goods and services through emerging technologies (service science) and their impact on organisations, markets, industries and society.
- How is the web reshaping business and how can business leverage emerging technologies?
- Search for innovations.
- Understand concepts of business intelligence, market analysis, technology road mapping and scenarios.
- Future forecasting and research methods and theories of technological innovation and diffusion.
- Technological Trends: What innovations in the emerging technologies can we expect in the near future?  
Selected information technology trends: cloud computing, social media system, crowdsourcing, Web 3.0, etc.

#### **Learning activities and teaching methods:**

**Mode of delivery:** Lectures, exercises/seminars, course assignments, exam 27h lectures/exercises/seminars, 80h independent work.

#### **Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students

#### **Recommended optional programme components:**

**Prerequisites:** None

#### **Recommended or required reading:**

**Study materials:** Refer to the course web pages

#### **Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam

#### **Grading:**

**Grading:** 1–5

#### **Person responsible:**

**Responsible person:** Harri Oinas-Kukkonen

### **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:** Tiikkaja, Marjo Kristiina

**Opintokohteen kielet:** English

#### **Language of instruction:**

**Language of instruction:** English

#### **Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

#### **Learning outcomes:**

**Objective:** Modern information systems contain many vendor-supplied components that must be selected, integrated, tested, and installed. This course analyses current practices in systems integration, including enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), and data integration among others. Further, this course explores the impact of enterprise systems on work practices and the role of the systems in transforming global organisations and markets. This course also analyses companies and their information systems as a part of a larger business environment and business (process) networks, including communal organisations and societal services with state authorities and partner companies.

**Learning Outcomes:** After completing the course, the student:

- Is able to evaluate the processes used in a competitive environment;
- Is able to describe how processes integrate the internal functions of the firm and allow the firm to interact with its environment;
- Is able to recognise, model, and improve processes to achieve efficiency and compliance objectives;
- Understand the role of ERP, SCM, and CRM systems etc. as components of the enterprise architecture;
- Understand process development and lifecycle management;

- Is able to explain the impact of automation on work practices.

**Contents:**

**Contents:**

- A strategic view of processes; concepts of organisational efficiency and effectiveness
- Integrating the functional areas of the organisation
- Relating processes to the financial, customer, and product-oriented goals of the firm
- Supply chain management (SCM)
- Customer relationship management (CRM)
- Enterprise management systems (ERP)
- Collaborative systems
- Knowledge management systems

**Learning activities and teaching methods:**

**Mode of delivery:** The overall workload for each student in this course is 105 hours. The course will be arranged for the first time in 2011/2012, and a detailed plan of the course is not yet available. Therefore, the distribution of this 105-hour workload amongst the different parts of the course will be announced on the course webpage before the course starts.

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Understanding of the software business, business process modelling, legacy information systems and basics of accounting helps.

**Recommended or required reading:**

**Study materials:** Refer to the course webpages

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Marjo Tiikkaja

## 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:** Kuutti, Kari Pekka Tapani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ects

**Language of instruction:**

English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The course gives a broad overview of the issues related to ICT based organisational change and how to understand and manage it. The outset is that an organisation develops a plan to change its functioning to a more desired way compared to the current one, or invents a novel business plan. The first issue is to find the "desired" future way of operating. The second issue is to manage the organisational transition from the old way of operation to the new one. Quite often the organisational change is related to the introduction of a new information system that is purchased from an outside vendor; therefore the issues of ICT sourcing are investigated in the course

**Learning Outcomes:** After completing the course the student recognises a wide spectrum of literature of organisational change, is able to analyse the various ways the change originates and proceeds, and is able to interpret and model the ICT based organisational change process.

**Contents:**

**Contents:** The course covers issues of change strategies, organisational structures and transformations within organisations, the organisational role of ICT, the meaning of leadership, management challenges when leading people, ICT and knowledge. Case examples of successful and failed change processes are presented and analysed, as well as the problem of escalation (a failing course is pursued too long) and de-escalation (how to stop or redirect a troubled ICT based change process). The role of power, trust and control in the change process is discussed. The different aspects of change agents are presented and analysed.

**Learning activities and teaching methods:**

**Mode of delivery:** Introductory lectures 20h, seminar sessions 20h, independent work 90h for two presentations:

1. 1 review of selected course materials (individual assignment, and
2. 2 change process report that models an ICT related organisational change (team assignment).

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of organisations.

**Recommended or required reading:**

**Study Materials:** Articles and book chapters to be announced during the course implementation.

**Assessment methods and criteria:**

**Assessment Methods:** Lecture and seminar participation, two assignments (literature review, ICT change modelling report); alternatively by examination.

**Grading:**

1-5

**Person responsible:**

**Responsible Person:** to be defined later

**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:** Juustila, Antti Juhani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, spring semester, period 4

**Learning outcomes:**

**Objective:** This course develops a managerial level of technical knowledge and terminology for data and media (voice, image, video, virtual reality) communications and computer networks to effectively communicate with technical, operational and management people in telecommunications. The course develops capabilities that enable the students to make intelligent choices about computer architectures and platforms with appropriate emphasis on both organisational integration and flexibility.

**Learning Outcomes:** After completing the course, students:

- Understand and apply data communications concepts to situations encountered in industry;
- Learn general concepts and techniques of data communications;
- Understand the technology of the Internet;
- Understand the most important server and storage architectures and the main mechanisms for providing high-capacity processing and storage capacity;
- Understand the regulatory and business environment.

**Contents:**

**Contents:**

1. Introduction to large-scale computing applications.
2. Standards and standards bodies.
3. Broadband networks.
4. Mobile and wireless networks.
5. Services, protocols and technologies.
6. Next-Generation Network (NGN) infrastructure.
7. Middleware, SOA, SaaS, Cloud, Grid.
8. The Internet Economy.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 48h, Student work and reporting 92h

**Target group:**

**Target group:** Master's level students of the IS Oriented Module (compulsory), Master's level students of the SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites** Student is familiar with basic computer architecture and the Internet.

**Recommended or required reading:**

**Study materials:** Lecture notes, Supplementary technical and scientific articles.

Reference books:

- Comer, D.E. (2009) Computer Networks and Internets. 5<sup>th</sup> edition. Pearson ISBN 0-13-504583-5. 600 p.
- Kurose J.F., Ross K.W. (2010) Computer Networking – A Top-Down Approach. 5<sup>th</sup> edition. Pearson ISBN 0-13-136548-7. 888 p.
- Simon, P. (2010) The Next Wave of Technologies. Wiley ISBN-13 978-0470587508, 432 p.
- Rhoton, J. (2009) Cloud Computing Explained,.Recursive Press, ISBN-13: 978-0956355607, 508 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:**

**Assessment methods:** Exam & report evaluation.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Antti Juustila

## 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:** Mikko Siponen

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** No modern organisations can survive without investment on information security. This course examines the investment in organisations' information security from the viewpoint of information security management, namely what the information security manager needs to know to secure the critical assets and systems of his/her organisation.

**Learning Outcomes:** After completing the course, the student is able to:

- Develop BPC;
  - Develop organisation specific information security policies and sub-policy systems at 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 standards;
- Understand the certifications in the area of information security management;
- Design information security policies at organisations.

**Contents:****Contents: 1**

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.

**Learning activities and teaching methods:**

**Mode of delivery:** lectures 30h, exercises 18h, student preparation and reading for exercises and examination ~50h.

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Course "Introduction to Information Security" or principles of information security, or similar knowledge obtained from other courses.

**Recommended or required reading:**

**Study materials:** articles (to be announced later).

**Assessment methods and criteria:**

**Assessment methods:** examination.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Mikko Siponen

**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

**Opettajat:** Tuure Tuunanen

**Opintokohteen kielet:** English

**ECTS Credits:**

7 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's studies, autumn semester, periods 1 & 2

**Learning outcomes:**

**Objective:** The academic goal of most graduate students in the medium term is to complete a unique research project (e.g. Masters or PhD Theses). Therefore, the graduate program in the Department of ISP is designed to prepare students for research. A basic grounding in the concepts underlying research in the discipline is essential if students are to succeed in completing the graduate program. This course is designed to introduce students to IS research. Students need to understand the nature of IS as a discipline and current research issues and themes. A number of current research areas will be identified and representative papers examined.

**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:****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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 48h, class preparation 48h and exercises 91h)

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory) and GS<sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** "Research Methods" course (813621S). 813601S is a substantive overview of research in information systems not a methods course, and students should be familiar with research methods prior enrolling to 813601S.

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation

**Assessment methods and criteria:****Assessment methods:**

Paper summaries	15%
Class Discussion	15%
Class Quizzes	15%
Research Proposals	5%
Essay Assignment One	25%
Essay Assignment Two	25%

Note that there is no final exam.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Tuure Tuunanen

**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:** Anna-Liisa Syrjänen

**Opintokohteen kielet:** English

**ECTS Credits:**

4 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, period 3

**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 understands the role of human interaction with products and services and can identify factors and problems related to it in a practical 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 GUI design;
- Use interaction design methods to create a novel interface.

**Contents:**

**Contents:** The first part provides a broad overview of interaction design, introducing the key issues and activities of the subject, for example, 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 2 addresses a key activity in interaction design: that of establishing requirements for an interactive product, 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 4 presents the techniques and knowledge necessary to evaluate an interactive product.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20 h, assignment and tutoring 55 h and exam 30 h.

**Target group:**

**Target group:** Master's level students of the IS Oriented Module (compulsory), Master's level students of the SE Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** none

**Recommended or required reading:**

Study materials: Sharp, Rogers, Preece: Interaction Design: Beyond Human-Computer Interaction (2nd ed.), John Wiley 2007

**Assessment methods and criteria:**

**Assessment methods:** Exam 50 %, assignment 50 %

**Grading:**

1-5

**Person responsible:**

Kari Kuutti / Anna-Liisa Syrjänen

## 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:** Tero Vartiainen

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ects

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, autumn semester, period 1

**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 a variety of techniques.

**Learning Outcomes:** After completing the course, a student understands the complexity of business, organisational, technical, and human aspects that affect ISD and can select methods in ISD. The student also understands the defects of traditional waterfall model and how other methods aim to answer its defects and 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 an organisation into a coherent whole and to take into account job satisfaction issues in addition to efficiency demands in ISD in planning workflows in an organisation. The student is also able to assess and give arguments as to which method is suitable for an ISD project in an organisation. In addition, the student understands the issues relating to managing global systems.

**Contents:**  
**Contents:**

1. Information systems development (ISD)
2. The life cycle approach, waterfall model
3. Methodologies and techniques of ISD
4. Managing global systems

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, exercises 25h, homework 30h, essay 30h, examination 30h

**Target group:**

**Target Group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Awareness and understanding of data modelling and object modelling in ISD

**Recommended or required reading:**

**Study materials:**

- Avison, D., Fitzgerald, G. (2006) Information Systems Development, methodologies, techniques & tools. Fourth Edition. London: McGraw-Hill.
- Laudon, K.C., Laudon, J.P. (2010) Management Information Systems, Managing the Digital Firm. Eleventh Edition. Upper Saddle River, New Jersey: Pearson Education. Chapter 15: Managing Global Systems.

**Assessment methods and criteria:**

**Assessment methods:** Examination and active participation in exercises.

**Grading:**

1-5

**Person responsible:**

Tero Vartiainen

## 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

**Language of instruction:**

English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The course aims to provide students with an understanding of the contemporary software business environment in mainland China and an appreciation of some of the implications for firms seeking to undertake software business there.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, assignment 60h, and exam 60. 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.

**Target group:**

**Target group:** all Master's level students and GS <sup>3</sup>D students, optional

**Recommended or required reading:**

**Study materials:** There is no prescribed textbook for this course. Instead, a reading brick comprising of 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:**

**Assessment methods:** 1) Exam (50%), 2) home assignment and in-class presentation (50%).

**Grading:**

1-5

**Person responsible:**

Xiaosong Zheng

## 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The focus of the course is in the software development environments and tools for embedded platforms, such as Android, MeeGo, and PIC32. In addition, the course covers memory and power management, the core services of the platform, and the utilisation of existing libraries, such as Qt.

**Learning Outcomes:** After completing the course, a student can use the essential software development tools of a selected embedded platform, and is able to work with them. 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:**

**Contents:** The course covers various embedded software development platforms, such as Android, MeeGo, and PIC32. 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.

**Learning activities and teaching methods:****Mode of delivery:** Lectures and exercises about 30h, exercise work about 75h**Target group:****Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)**Recommended optional programme components:****Prerequisites:** Course "Real-time Distributed Software Development", C/C++ and/or Java programming skills or similar knowledge obtained from other courses.**Recommended or required reading:****Study materials:** Course material, the documentation of selected technologies, and other related literature**Assessment methods and criteria:****Assessment methods:** Exercise work**Grading:****Grading:** 1–5**Person responsible:****Responsible person:** Henrik Hedberg**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

**Language of instruction:****Language of instruction:** English**Timing:****Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, autumn semester, period 2**Learning outcomes:****Objective:** The course will focus on information systems that relate to human behaviour change. Scientific articles on the topic will be discussed in the course. The course will help the student to recognise how the Web, mobile services and other IT systems can be, are being, and will be used to influence human attitudes and behaviour**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:****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.**Learning activities and teaching methods:****Mode of delivery:** Lectures 27h, reflective personal exercises 24h, independent work 80h**Target group:****Target group:** all Master's level and GS <sup>3</sup>D students (optional)**Recommended optional programme components:****Pre-requirements:** Understanding the roles of humans as users and developers of ICT**Recommended or required reading:****Study materials:** Textbook, the web, to be announced more specifically during the course implementation

**Assessment methods and criteria:****Assessment methods:** Exam, personal exercise reports**Grading:****Grading:** 1–5**Person responsible:****Responsible person:** Harri Oinas-Kukkonen**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

**Language of instruction:**

English

**Timing:**2<sup>nd</sup> year of Master's studies, autumn semester, periods 1 & 2**Learning outcomes:****Objective:** 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.**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. The most popular OSS development projects are the Linux operating system, the OpenOffice suite, Mozilla/Firefox web browsers, and the Apache web server, but the size and type of projects vary. 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.

**Learning activities and teaching methods:**

Lectures and seminars about 30h, seminar preparation about 30h, seminar paper about 55h

**Target group:**Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS<sup>3</sup>D students (compulsory)**Recommended optional programme components:**

Compulsory prerequisites are 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 or required reading:**

International articles covering the topic, empirical data from real OSS projects

**Assessment methods and criteria:**

Participation in seminars and a seminar paper

**Grading:**

1-5

**Person responsible:**

Henrik Hedberg

## 814601S: Progressive sandwich training, 5 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Practical training

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

### ECTS Credits:

5 ects

### Language of instruction:

Finnish

### Timing:

free

### Learning outcomes:

**Objective:** The course aims to lower students' threshold and integration to working life. It gives students the opportunity to gain demanding work experience corresponding to university level studies. Students are required to reflect their studies in experience in professional ICT work.

**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 their work experience.

### Contents:

### Contents:

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

### Learning activities and teaching methods:

**Mode of delivery:** Professional ICT responsibilities and at least four months to fulfil the learning outcomes.

### Target group:

**Target group:** Master's level students

### Recommended optional programme components:

**Prerequisites:** -

### Recommended or required reading:

**Study materials:** Studies and selected course materials are reflected on experience in professional ICT work.

### Assessment methods and criteria:

**Assessment methods:** Working on professional ICT responsibilities altogether for at least four months. To write a work report of 4 to 8 pages. The work experience is proved by delivering a signed letter of reference and extract of study attainments 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:

**Grading:** Approved failed.

### Person responsible:

Kari Pankkonen

### Other information:

**Työssä oppimista:** Kyllä; ks. kohdat Työtavat ja Sisältö

## 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, periods 1 & 2

**Learning outcomes:**

**Objective:** The course presents the theoretic background of real-time distributed systems, a model-based development methodology, and embedded, ubiquitous and mobile design examples.

**Learning Outcomes:** After completing the course, the student:

- Is able to analyse the characteristic 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:**

**Contents:**

Introduction:

- Characteristics of Real-Time Systems
- Timeliness
- Resource management
- Safety and Reliability
- Concurrency
- Security
- Multitasking, Interrupts
- Scheduling
- Hardware Interfaces

Characteristics of Distribution

- Centralised
- Client-server
- Clusters
- Cloud
- Peer-to-peer
- Ad hoc
- Concept of time
- Synchronisation
- Latency and jitter
- Quality of Service
- Service Discovery
- Networking primitives
- Networking frameworks

Real-Time UML Modelling Methodology

Real-Time Design Patterns

Design Examples: Embedded, Ubiquitous, Mobile, Web/Internet

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 45h, Design exercises 15h, Student projects 100h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module and GS<sup>3</sup>D students (optional)

**Recommended optional programme components:**

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

**Recommended or required reading:**

**Study materials:** Lecture notes based on reference books

- Douglass B.P. (1999) Doing Hard Time – Developing Real-Time Systems with UML – Objects, Frameworks. And Patterns. Addison-Wesley ISBN 0-201-49837-5. 749 p.



- Douglass B.P. (2007) Real-Time UML – Advances in the UML for Real-Time Systems. 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.
- Douglass B.P. (2009) Real-Time Agility – The Harmony/ESW Method for Real-Time and Embedded Systems Development. Addison-Wesley ISBN 0-321-54549-4. 522 p.
- Douglass B.P. (2007) Real-Time UML Workshop for Embedded Systems. Elsevier. ISBN 978-0-7506-7906-0. 408 p.
- Comer D.E (2009) Computer networks and Internets. 5th edition. Pearson – Prentice Hall. ISBN 978-0-13-504583-1. 600 p.

**Assessment methods and criteria:**

**Assessment methods:** Exam and project evaluation.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Petri Pulli

## 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

**Language of instruction:**

Finnish

**Timing:**

2nd - 5th year, periods 1-4

**Learning outcomes:**

Objective: Small-group tutor guides new students to the academic studies and academic life. The tutor receives experiences in student supervision and guiding, which build important capacities for IT-professional.

Learning Outcomes:

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

1. Draw up supervision plan to his / her small group.
2. Put into effect his / her supervision from the viewpoint of students and based on the given tutor training.
3. Receive supervision and guiding experience.
4. Take responsibility of his / her own supervision work.

**Contents:**

1. Common training, occasions and meetings, 2. Planning and implementation of small-group tutoring 3. Writing his / her own report diary.

**Learning activities and teaching methods:**

Lectures, exercises and meetings. Doing as a small-group tutor in co-operation with other tutors, Blanko student organization, library and own department's study-counselors. Independent personal work.

**Target group:**

2nd - 5th year

**Recommended optional programme components:**

-

**Recommended or required reading:**

Training materials, forms and own reports.

**Assessment methods and criteria:**

Active participation in tutor-training, implementing the small-group tutoring and drawing up the supervision plan and the report diary.

**Grading:**

Approved / failed.

**Person responsible:**

Heli Alatalo

**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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup>-2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 28–34h, an exam 25h, a group work 30h, course assignments and independent work 50.5–44.5h.

**Target group:**

**Target group:** Master's level students (optional) and GS<sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic understanding of the software business is of advantage.

**Recommended or required reading:**

**Study materials:** Refer to the course web pages.

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam.

**Grading:**

1-5

**Person responsible:**

Marianne Kinnula (marianne.kinnula@oulu.fi)

## 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<sup>st</sup> year of Master's studies; 2011-2012 spring semester, period 4; 2012 fall semester, period 1; in the following years the course will be implemented during the fall semester.

### Learning outcomes:

After completing the course, the student

- Can define the key success factors of the 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 teaching 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 (article presentations and acting as opponents) for groups of 4 students. Study groups with groups of 8 students using case-based teaching method. Communication between exercise groups is done over the internet.

### Learning activities and teaching methods:

Lectures and seminars involving all the students 30h and 30 h of reading (in English), study groups involving 8 students 20h, and exercises 50h. During the seminars a team of 4 students will present a selected research article and another team of 4 students will act as opponents. In the study groups a relevant teaching case from industry is discussed with the students. Each student will prepare a written analysis of the case before the discussion and a reflective analysis after the discussion. 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.

### 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 (20%), lecture assignments (30%), study groups (10%), exercises (40%).

### Person responsible:

Jouni Similä

### Working life cooperation:

No

**Other information:**

Participation: The course is obligatory for GS<sup>3D</sup> 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

**Opintokohteen kielet:** English

**ECTS Credits:**

4 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's and GS<sup>3D</sup> studies, autumn semester, period 2

**Learning outcomes:**

**Objective:** The course gives an introduction to fundamental software engineering management, measurement and improvement concepts, methods and techniques in traditional, agile and lean development. The course covers both principles as well as current trends in software processes. The teaching is supplemented with examples from practical software engineering.

**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:**

**Contents:** The course covers the most fundamental process centred software quality improvement approaches, methods and latest research results. The topics of the course include: software processes, quality and quality standards, organisational level quality, process quality, process improvement approaches, software process and product measurement, agile and lean methods, quality improvement in company level and practical examples from the software industry.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, study group working 25h, paper reading 25h, exercises 15h, report writing 20h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS<sup>3D</sup> students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation but has been initially planned to be:

- 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

**Assessment methods and criteria:**

**Assessment methods:** Report evaluation

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Burak Turhan

## 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

### Timing:

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 3

### Learning outcomes:

**Objective:** The course gives an introduction to the core tasks of large-scale industrial software production and maintenance, focusing in software product line engineering, continuous integration/delivery and software maintenance.

**Learning Outcomes:** After completing the course, the student:

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

### Contents:

#### Contents:

Product line engineering

- Product line variability
- Domain engineering
- Application engineering

Continuous integration/delivery

- Principles and practices of continuous delivery
- Ecosystem: automated testing, configuration management
- Implementing a deployment pipeline

Software maintenance

- Categories of maintenance
- Process of software maintenance

### Learning activities and teaching methods:

**Mode of delivery:** Lectures 32h, study group working 32h, report writing 44h

### Target group:

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

### Recommended optional programme components:

**Prerequisites:** Basic knowledge of software engineering and software architectures

### Recommended or required reading:

**Study materials:** This list is preliminary. An updated list of study materials can be found in the course web pages.

- Pohl, K., Böckle, G., van der Linden, F. Software Product Line Engineering. Foundations, Principles, and Techniques, Springer-Verlag, 2005
- 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
- Duvall P., Matyas S., Glover A., Continuous integration – Improving software quality and reducing risks, Addison-Wesley, 2007
- Humble J., Farley D., Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, Addison-Wesley, 2011
- [Gopaldaswamy, R.](#), Ramesh, B., Software maintenance: effective practices for geographically distributed environments, Tata McGraw-Hill, 2006 - [Computers](#) - 456 pages

### Assessment methods and criteria:

**Assessment methods:** Exam and assignment report, exam can be replaced by study group work

**Grading:****Grading:** 1–5**Person responsible:****Responsible person:** Samuli Saukkonen**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**Opintokohteen kielet:** English**Leikkaavuudet:**

ay815311A Software Quality and Testing (OPEN UNI) 5.0 op

**ECTS Credits:**

5 ECTS

**Language of instruction:****Language of instruction:** English**Timing:****Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, period 1**Learning outcomes:**

**Objective:** The course gives an introduction to software quality, software quality assurance and quality techniques, such as review, inspection and testing at different testing levels. Quality techniques will be taught with appropriate tools. The course also introduces current principles in test-driven development and test automation and models for reviewing and testing process improvement.

**Learning Outcomes:** After completing the course, the student can explain different views on software quality and use quality models for its assessment. The student can analyse the benefits and obstacles of reviews, inspection and testing as a part of software engineering and defect removal techniques. The student can conduct the review as part of a review team and use an appropriate supporting tool. The student knows testing levels, strategies and techniques, can create test cases and conduct unit testing, test driven development, integration testing and acceptance testing with appropriate testing tools. The student can also explain the benefits and obstacles of test automation and knows models for the reviewing and testing of process improvement.

**Contents:**

**Contents:** Software quality and quality assurance. Software reviews and inspection. Software testing. Test-driven development. Test automation. Reviewing and testing process improvement.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 30h, study group working 25h, paper reading 25h, exercises 25h, report writing 30h

**Target group:**

**Target Group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation but has been initially planned to be:

- Galin D., "Software Quality Assurance: From theory to implementation", Addison-Wesley, 2004
- Mathur A.P., "Foundations of Software Testing", Prentice Hall, 2008
- Pezze M., Young M., "Software Testing and Analysis: Process, Principles and Techniques", John Wiley&Sons, 2008

**Assessment methods and criteria:**

**Assessment methods:** Report evaluation

**Grading:****Grading:** 1–5**Person responsible:****Responsible person:** Burak Turhan

## 812671S: User Experience (UX) and Usability Evaluation, 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** This course gives an introduction to basics of designing and following through a usability testing process.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 24h, assignment tutoring 14h, assignment 90h, seminar 7h.

**Target group:**

**Target Group:** all Master's level and GS<sup>3D</sup> students, optional

**Recommended optional programme components:**

**Prerequisites:** Student is familiar with most common user interface design terms, design and evaluation methods as in "Introduction to Human-Computer Interactions" course.

**Recommended or required reading:**

**Study materials:**

- 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 methods:** Assignment, seminar

**Grading:**

**Grading:** Pass/fail

**Person responsible:**

Mikko Rajanen

**Other information:**

**Work placements:** 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

**Language of instruction:**

English

**Timing:****Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's and GS<sup>3</sup>D studies, spring semester, period 4**Learning outcomes:****Objective:** The course aims to provide students with an understanding of the contemporary software business environment in mainland China and an appreciation of some of the implications for firms seeking to undertake software business there.**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:****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.**Learning activities and teaching methods:****Mode of delivery:** Lectures 20h, assignment 60h, and exam 60. 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.**Target group:****Target group:** all Master's level students and GS<sup>3</sup>D students, optional**Recommended or required reading:****Study materials:** There is no prescribed textbook for this course. Instead, a reading brick comprising of 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:****Assessment methods:** 1) Exam (50%), 2) home assignment and in-class presentation (50%).**Grading:**

1-5

**Person responsible:**

Xiaosong Zheng

**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:** Tiikkaja, Marjo Kristiina**Opintokohteen kielet:** English**Language of instruction:****Language of instruction:** English**Timing:****Timing:** 1<sup>st</sup> year of Master's and GS<sup>3</sup>D studies, spring semester, period 4**Learning outcomes:****Objective:** Modern information systems contain many vendor-supplied components that must be selected, integrated, tested, and installed. This course analyses current practices in systems integration, including enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), and data integration among others. Further, this course explores the impact of enterprise systems on work practices and the role of the systems in transforming global organisations and markets. This course also analyses companies and their



information systems as a part of a larger business environment and business (process) networks, including communal organisations and societal services with state authorities and partner companies.

**Learning Outcomes:** After completing the course, the student:

- Is able to evaluate the processes used in a competitive environment;
- Is able to describe how processes integrate the internal functions of the firm and allow the firm to interact with its environment;
- Is able to recognise, model, and improve processes to achieve efficiency and compliance objectives;
- Understand the role of ERP, SCM, and CRM systems etc. as components of the enterprise architecture;
- Understand process development and lifecycle management;
- Is able to explain the impact of automation on work practices.

**Contents:**

**Contents:**

- A strategic view of processes; concepts of organisational efficiency and effectiveness
- Integrating the functional areas of the organisation
- Relating processes to the financial, customer, and product-oriented goals of the firm
- Supply chain management (SCM)
- Customer relationship management (CRM)
- Enterprise management systems (ERP)
- Collaborative systems
- Knowledge management systems

**Learning activities and teaching methods:**

**Mode of delivery:** The overall workload for each student in this course is 105 hours. The course will be arranged for the first time in 2011/2012, and a detailed plan of the course is not yet available. Therefore, the distribution of this 105-hour workload amongst the different parts of the course will be announced on the course webpage before the course starts.

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Understanding of the software business, business process modelling, legacy information systems and basics of accounting helps.

**Recommended or required reading:**

**Study materials:** Refer to the course webpages

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Marjo Tiikkaja

## **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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, autumn semester, period 2

**Learning outcomes:**

**Objective:** The course will focus on information systems that relate to human behaviour change. Scientific articles on the topic will be discussed in the course. The course will help the student to recognise how the Web, mobile services and other IT systems can be, are being, and will be used to influence human attitudes and behaviour

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 27h, reflective personal exercises 24h, independent work 80h

**Target group:**

**Target group:** all Master's level and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Pre-requirements:** Understanding the roles of humans as users and developers of ICT

**Recommended or required reading:**

**Study materials:** Textbook, the web, to be announced more specifically during the course implementation

**Assessment methods and criteria:**

**Assessment methods:** Exam, personal exercise reports

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Harri Oinas-Kukkonen

## 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:** Kuutti, Kari Pekka Tapani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ects

**Language of instruction:**

English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The course gives a broad overview of the issues related to ICT based organisational change and how to understand and manage it. The outset is that an organisation develops a plan to change its functioning to a more desired way compared to the current one, or invents a novel business plan. The first issue is to find the "desired" future way of operating. The second issue is to manage the organisational transition from the old way of operation to the new one. Quite often the organisational change is related to the introduction of a new information system that is purchased from an outside vendor; therefore the issues of ICT sourcing are investigated in the course

**Learning Outcomes:** After completing the course the student recognises a wide spectrum of literature of organisational change, is able to analyse the various ways the change originates and proceeds, and is able to interpret and model the ICT based organisational change process.

**Contents:**

**Contents:** The course covers issues of change strategies, organisational structures and transformations within organisations, the organisational role of ICT, the meaning of leadership, management challenges when leading people, ICT and knowledge. Case examples of successful and failed change processes are presented and analysed, as well as the problem of escalation (a failing course is pursued too long) and de-escalation (how to stop or redirect a troubled ICT based change process). The role of power, trust and control in the change process is discussed. The different aspects of change agents are presented and analysed.

**Learning activities and teaching methods:**

**Mode of delivery:** Introductory lectures 20h, seminar sessions 20h, independent work 90h for two presentations:

1. 1 review of selected course materials (individual assignment, and
2. 2 change process report that models an ICT related organisational change (team assignment).

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of organisations.

**Recommended or required reading:**

**Study Materials:** Articles and book chapters to be announced during the course implementation.

**Assessment methods and criteria:**

**Assessment Methods:** Lecture and seminar participation, two assignments (literature review, ICT change modelling report); alternatively by examination.

**Grading:**

1-5

**Person responsible:**

**Responsible Person:** to be defined later

## 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:** Juustila, Antti Juhani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, spring semester, period 4

**Learning outcomes:**

**Objective:** This course develops a managerial level of technical knowledge and terminology for data and media (voice, image, video, virtual reality) communications and computer networks to effectively communicate with technical, operational and management people in telecommunications. The course develops capabilities that enable the students to make intelligent choices about computer architectures and platforms with appropriate emphasis on both organisational integration and flexibility.

**Learning Outcomes:** After completing the course, students:

- Understand and apply data communications concepts to situations encountered in industry;
- Learn general concepts and techniques of data communications;
- Understand the technology of the Internet;
- Understand the most important server and storage architectures and the main mechanisms for providing high-capacity processing and storage capacity;
- Understand the regulatory and business environment.

**Contents:****Contents:**

1. Introduction to large-scale computing applications.
2. Standards and standards bodies.
3. Broadband networks.
4. Mobile and wireless networks.
5. Services, protocols and technologies.
6. Next-Generation Network (NGN) infrastructure.
7. Middleware, SOA, SaaS, Cloud, Grid.
8. The Internet Economy.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 48h, Student work and reporting 92h

**Target group:**

**Target group:** Master's level students of the IS Oriented Module (compulsory), Master's level students of the SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites** Student is familiar with basic computer architecture and the Internet.

**Recommended or required reading:**

**Study materials:** Lecture notes, Supplementary technical and scientific articles.

## Reference books:

- Comer, D.E. (2009) Computer Networks and Internets. 5<sup>th</sup> edition. Pearson ISBN 0-13-504583-5. 600 p.
- Kurose J.F., Ross K.W. (2010) Computer Networking – A Top-Down Approach. 5<sup>th</sup> edition. Pearson ISBN 0-13-136548-7. 888 p.
- Simon, P. (2010) The Next Wave of Technologies. Wiley ISBN-13 978-0470587508, 432 p.
- Rhoton, J. (2009) Cloud Computing Explained,.Recursive Press, ISBN-13: 978-0956355607, 508 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:**

**Assessment methods:** Exam & report evaluation.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Antti Juustila

**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:** Mikko Siponen

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** No modern organisations can survive without investment on information security. This course examines the investment in organisations' information security from the viewpoint of information security management, namely what the information security manager needs to know to secure the critical assets and systems of his/her organisation.

**Learning Outcomes:** After completing the course, the student is able to:

- Develop BPC;
  - Develop organisation specific information security policies and sub-policy systems at 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 standards;
  - Understand the certifications in the area of information security management;
  - Design information security policies at organisations.

**Contents:**

**Contents: 1**

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.

**Learning activities and teaching methods:**

**Mode of delivery:** lectures 30h, exercises 18h, student preparation and reading for exercises and examination ~50h.

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Course "Introduction to Information Security" or principles of information security, or similar knowledge obtained from other courses.

**Recommended or required reading:**

**Study materials:** articles (to be announced later).

**Assessment methods and criteria:**

**Assessment methods:** examination.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Mikko Siponen

## 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:** Anna-Liisa Syrjänen

**Opintokohteen kielet:** English

**ECTS Credits:**

4 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, period 3

**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 understands the role of human interaction with products and services and can identify factors and problems related to it in a practical 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 GUI design;
- Use interaction design methods to create a novel interface.

**Contents:**

**Contents:** The first part provides a broad overview of interaction design, introducing the key issues and activities of the subject, for example, 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 2 addresses a key activity in interaction design: that of establishing requirements for an interactive product, 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 4 presents the techniques and knowledge necessary to evaluate an interactive product.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20 h, assignment and tutoring 55 h and exam 30 h.

**Target group:**

**Target group:** Master's level students of the IS Oriented Module (compulsory), Master's level students of the SE Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** none

**Recommended or required reading:**

Study materials: Sharp, Rogers, Preece: Interaction Design: Beyond Human-Computer Interaction (2nd ed.), John Wiley 2007

**Assessment methods and criteria:**

**Assessment methods:** Exam 50 %, assignment 50 %

**Grading:**

1-5

**Person responsible:**

Kari Kuutti / Anna-Liisa Syrjänen

**814601S: Progressive sandwich training, 5 op**

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Practical training

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

5 ects

**Language of instruction:**

Finnish

**Timing:**

free

**Learning outcomes:**

**Objective:** The course aims to lower students' threshold and integration to working life. It gives students the opportunity to gain demanding work experience corresponding to university level studies. Students are required to reflect their studies in experience in professional ICT work.

**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 their work experience.

**Contents:****Contents:**

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

**Learning activities and teaching methods:**

**Mode of delivery:** Professional ICT responsibilities and at least four months to fulfil the learning outcomes.

**Target group:**

**Target group:** Master's level students

**Recommended optional programme components:**

**Prerequisites:** -

**Recommended or required reading:**

**Study materials:** Studies and selected course materials are reflected on experience in professional ICT work.

**Assessment methods and criteria:**

**Assessment methods:** Working on professional ICT responsibilities altogether for at least four months. To write a work report of 4 to 8 pages. The work experience is proved by delivering a signed letter of reference and extract of study attainments 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:**

**Grading:** Approved failed.

**Person responsible:**

Kari Pankkonen

**Other information:**

**Työssä oppimista:** Kyllä; ks. kohdat Työtavat ja Sisältö

**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

**Language of instruction:**

Finnish

**Timing:**

2nd - 5th year, periods 1-4

**Learning outcomes:**

**Objective:** Small-group tutor guides new students to the academic studies and academic life. The tutor receives experiences in student supervision and guiding, which build important capacities for IT-professional.

**Learning Outcomes:**

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

1. Draw up supervision plan to his / her small group.
2. Put into effect his / her supervision from the viewpoint of students and based on the given tutor training.
3. Receive supervision and guiding experience.
4. Take responsibility of his / her own supervision work.

**Contents:**

1. Common training, occasions and meetings, 2. Planning and implementation of small-group tutoring 3. Writing his / her own report diary.

**Learning activities and teaching methods:**

Lectures, exercises and meetings. Doing as a small-group tutor in co-operation with other tutors, Blanko student organization, library and own department's study-counselors. Independent personal work.

**Target group:**

2nd - 5th year

**Recommended optional programme components:**

-

**Recommended or required reading:**

Training materials, forms and own reports.

**Assessment methods and criteria:**

Active participation in tutor-training, implementing the small-group tutoring and drawing up the supervision plan and the report diary.

**Grading:**

Approved / failed.

**Person responsible:**

Heli Alatalo

**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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup>-2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 28–34h, an exam 25h, a group work 30h, course assignments and independent work 50.5–44.5h.

**Target group:**

**Target group:** Master's level students (optional) and GS<sup>3D</sup> students (compulsory)

**Recommended optional programme components:**



**Prerequisites:** Basic understanding of the software business is of advantage.

**Recommended or required reading:**

**Study materials:** Refer to the course web pages.

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam.

**Grading:**

1-5

**Person responsible:**

Marianne Kinnula (marianne.kinnula@oulu.fi)

## 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:** Tero Vartiainen

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ects

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS<sup>3D</sup> studies, autumn semester, period 1

**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 a variety of techniques.

**Learning Outcomes:** After completing the course, a student understands the complexity of business, organisational, technical, and human aspects that affect ISD and can select methods in ISD. The student also understands the defects of traditional waterfall model and how other methods aim to answer its defects and 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 an organisation into a coherent whole and to take into account job satisfaction issues in addition to efficiency demands in ISD in planning workflows in an organisation. The student is also able to assess and give arguments as to which method is suitable for an ISD project in an organisation. In addition, the student understands the issues relating to managing global systems.

**Contents:**

**Contents:**

1. Information systems development (ISD)
2. The life cycle approach, waterfall model
3. Methodologies and techniques of ISD
4. Managing global systems

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, exercises 25h, homework 30h, essay 30h, examination 30h

**Target group:**

**Target Group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS<sup>3D</sup> students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Awareness and understanding of data modelling and object modelling in ISD

**Recommended or required reading:**

**Study materials:**

- Avison, D., Fitzgerald, G. (2006) Information Systems Development, methodologies, techniques & tools. Fourth Edition. London: McGraw-Hill.
- Laudon, K.C., Laudon, J.P. (2010) Management Information Systems, Managing the Digital Firm. Eleventh Edition. Upper Saddle River, New Jersey: Pearson Education. Chapter 15: Managing Global Systems.

**Assessment methods and criteria:****Assessment methods:** Examination and active participation in exercises.**Grading:**

1-5

**Person responsible:**

Tero Vartiainen

**812671S: User Experience (UX) and Usability Evaluation, 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**Language of instruction:****Language of instruction:** English**Timing:****Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1**Learning outcomes:****Objective:** This course gives an introduction to basics of designing and following through a usability testing process.**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:****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.**Learning activities and teaching methods:****Mode of delivery:** Lectures 24h, assignment tutoring 14h, assignment 90h, seminar 7h.**Target group:****Target Group:** all Master's level and GS<sup>3D</sup> students, optional**Recommended optional programme components:****Prerequisites:** Student is familiar with most common user interface design terms, design and evaluation methods as in "Introduction to Human-Computer Interactions" course.**Recommended or required reading:****Study materials:**

- 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 methods:** Assignment, seminar**Grading:****Grading:** Pass/fail**Person responsible:**

Mikko Rajanen

**Other information:****Work placements:** 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:** Kuutti, Kari Pekka Tapani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ects

**Language of instruction:**

English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS<sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The course gives a broad overview of the issues related to ICT based organisational change and how to understand and manage it. The outset is that an organisation develops a plan to change its functioning to a more desired way compared to the current one, or invents a novel business plan. The first issue is to find the "desired" future way of operating. The second issue is to manage the organisational transition from the old way of operation to the new one. Quite often the organisational change is related to the introduction of a new information system that is purchased from an outside vendor; therefore the issues of ICT sourcing are investigated in the course

**Learning Outcomes:** After completing the course the student recognises a wide spectrum of literature of organisational change, is able to analyse the various ways the change originates and proceeds, and is able to interpret and model the ICT based organisational change process.

**Contents:**

**Contents:** The course covers issues of change strategies, organisational structures and transformations within organisations, the organisational role of ICT, the meaning of leadership, management challenges when leading people, ICT and knowledge. Case examples of successful and failed change processes are presented and analysed, as well as the problem of escalation (a failing course is pursued too long) and de-escalation (how to stop or redirect a troubled ICT based change process). The role of power, trust and control in the change process is discussed. The different aspects of change agents are presented and analysed.

**Learning activities and teaching methods:**

**Mode of delivery:** Introductory lectures 20h, seminar sessions 20h, independent work 90h for two presentations:

1. 1 review of selected course materials (individual assignment, and
2. 2 change process report that models an ICT related organisational change (team assignment).

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS<sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of organisations.

**Recommended or required reading:**

**Study Materials:** Articles and book chapters to be announced during the course implementation.

**Assessment methods and criteria:**

**Assessment Methods:** Lecture and seminar participation, two assignments (literature review, ICT change modelling report); alternatively by examination.

**Grading:**

1-5

**Person responsible:**

**Responsible Person:** to be defined later

## 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:** Juustila, Antti Juhani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, spring semester, period 4

**Learning outcomes:**

**Objective:** This course develops a managerial level of technical knowledge and terminology for data and media (voice, image, video, virtual reality) communications and computer networks to effectively communicate with technical, operational and management people in telecommunications. The course develops capabilities that enable the students to make intelligent choices about computer architectures and platforms with appropriate emphasis on both organisational integration and flexibility.

**Learning Outcomes:** After completing the course, students:

- Understand and apply data communications concepts to situations encountered in industry;
- Learn general concepts and techniques of data communications;
- Understand the technology of the Internet;
- Understand the most important server and storage architectures and the main mechanisms for providing high-capacity processing and storage capacity;
- Understand the regulatory and business environment.

**Contents:**

**Contents:**

1. Introduction to large-scale computing applications.
2. Standards and standards bodies.
3. Broadband networks.
4. Mobile and wireless networks.
5. Services, protocols and technologies.
6. Next-Generation Network (NGN) infrastructure.
7. Middleware, SOA, SaaS, Cloud, Grid.
8. The Internet Economy.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 48h, Student work and reporting 92h

**Target group:**

**Target group:** Master's level students of the IS Oriented Module (compulsory), Master's level students of the SE Oriented Module (optional) and GS<sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites** Student is familiar with basic computer architecture and the Internet.

**Recommended or required reading:**

**Study materials:** Lecture notes, Supplementary technical and scientific articles.

Reference books:

- Comer, D.E. (2009) Computer Networks and Internets. 5<sup>th</sup> edition. Pearson ISBN 0-13-504583-5. 600 p.
- Kurose J.F., Ross K.W. (2010) Computer Networking – A Top-Down Approach. 5<sup>th</sup> edition. Pearson ISBN 0-13-136548-7. 888 p.
- Simon, P. (2010) The Next Wave of Technologies. Wiley ISBN-13 978-0470587508, 432 p.
- Rhoton, J. (2009) Cloud Computing Explained, Recursive Press, ISBN-13: 978-0956355607, 508 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:**

**Assessment methods:** Exam & report evaluation.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Antti Juustila

**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:** Mikko Siponen

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's and GS<sup>3D</sup> studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** No modern organisations can survive without investment on information security. This course examines the investment in organisations' information security from the viewpoint of information security management, namely what the information security manager needs to know to secure the critical assets and systems of his/her organisation.

**Learning Outcomes:** After completing the course, the student is able to:

- Develop BPC;
  - Develop organisation specific information security policies and sub-policy systems at 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 standards;
  - Understand the certifications in the area of information security management;
  - Design information security policies at organisations.

**Contents:**

**Contents:** 1

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.

**Learning activities and teaching methods:**

**Mode of delivery:** lectures 30h, exercises 18h, student preparation and reading for exercises and examination ~50h.

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS<sup>3D</sup> students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Course "Introduction to Information Security" or principles of information security, or similar knowledge obtained from other courses.

**Recommended or required reading:**

**Study materials:** articles (to be announced later).

**Assessment methods and criteria:**

**Assessment methods:** examination.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Mikko Siponen

**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

**Opettajat:** Tuure Tuunanen

**Opintokohteen kielet:** English

**ECTS Credits:**

7 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's studies, autumn semester, periods 1 & 2

**Learning outcomes:**

**Objective:** The academic goal of most graduate students in the medium term is to complete a unique research project (e.g. Masters or PhD Theses). Therefore, the graduate program in the Department of ISP is designed to prepare students for research. A basic grounding in the concepts underlying research in the discipline is essential if students are to succeed in completing the graduate program. This course is designed to introduce students to IS research. Students need to understand the nature of IS as a discipline and current research issues and themes. A number of current research areas will be identified and representative papers examined.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 48h, class preparation 48h and exercises 91h)

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory) and GS<sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** "Research Methods" course (813621S). 813601S is a substantive overview of research in information systems not a methods course, and students should be familiar with research methods prior enrolling to 813601S.

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation

**Assessment methods and criteria:**

**Assessment methods:**

Paper summaries	15%
Class Discussion	15%
Class Quizzes	15%
Research Proposals	5%
Essay Assignment One	25%
Essay Assignment Two	25%

Note that there is no final exam.

**Grading:****Grading:** 1–5**Person responsible:****Responsible person:** Tuure Tuunanen**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**Timing:****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.**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

**Language of instruction:**

English

**Timing:**2<sup>nd</sup> year of Master's studies, autumn semester, periods 1 & 2**Learning outcomes:****Objective:** 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.**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. The most popular OSS development projects are the Linux operating system, the OpenOffice suite, Mozilla/Firefox web browsers, and the Apache web server, but the size and type of projects vary. 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.

**Learning activities and teaching methods:**

Lectures and seminars about 30h, seminar preparation about 30h, seminar paper about 55h

**Target group:**Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS<sup>3D</sup> students (compulsory)

**Recommended optional programme components:**

Compulsory prerequisites are 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 or required reading:**

International articles covering the topic, empirical data from real OSS projects

**Assessment methods and criteria:**

Participation in seminars and a seminar paper

**Grading:**

1-5

**Person responsible:**

Henrik Hedberg

**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:** Pankkonen, Kari Johannes

**Opintokohteen kielet:** English

**ECTS Credits:**

4 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of GS<sup>3D</sup> studies, autumn semester, period 1+2

**Learning outcomes:**

**Objective:** This course serves as the basis for purposeful study planning and successful studies within the programme.

**Learning Outcomes:** After completing the course a student:

- Is able to describe the basic elements of Finnish culture and history and the Finnish education system;
- Is able to discuss features of cultures and to identify intercultural competences;
- Can communicate effectively through different media and produce academic writing and presentations according to standards;
- Knows the actions and services of the most important organisations, units and communities from the viewpoint of his/her studies in the University of Oulu and possibilities for student influence in this environment;
- Recognises the basic characteristics of his/her own curriculum and its scientific basis, especially the discipline of information processing science;
- Is able to analyse his/her own studies and forthcoming study path;
- Is able to create, update and present his/her Personal Study Plan (PSP).

**Contents:****Contents:**

- Finnish culture, history and the educational system
- Intercultural learning and communication
- Academic communication and writing
- University of Oulu, the study environment and student influence on it
- Own department, own curriculum, its scientific basis and own study path
- The PSP process
- Intensive seminars.

**Learning activities and teaching methods:**

**Mode of delivery:** Group occasions, lectures and exercises, small group activities, personal supervision discussions, independent personal work, feedback days

**Target group:**

**Target group:** GS<sup>3D</sup> and other international students, compulsory



**Recommended or required reading:**

**Study materials:** Lecture materials, www-pages, Study guides, Brochures, Forms etc.

**Assessment methods and criteria:**

**Assessment methods:** Active participation, PSP

**Grading:**

**Grading:** pass/fail

**Person responsible:**

Risto Nuutinen

**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

**Language of instruction:**

English

**Timing:**

1<sup>st</sup> year of exchange and GS <sup>3</sup>D Master's studies, spring semester, periods 3 & 4 (recommended) or 2<sup>nd</sup> year, autumn semester, periods 1 & 2

**Learning outcomes:**

This course integrates the major advanced special studies of our curriculum. The aim is to demonstrate the student's ability to work on a challenging ICT project. Students will learn to acquire and apply knowledge in the topic of the project. The students will demonstrate their skills to conduct a project in a professional way.

By completing this course a student can act as an independent professional member of an ICT project and has learnt professionalism in the projects work and management.

**As a professional in conducting a project in a managed way the student:**

- Can plan the project;
- Can manage the progress of the project with steering group/project team organisation (reporting the progress and results of the project, the use of the steering group in decision making and problem resolution);
- Can follow the progress of the project in real time within the project team.
- Can work as a responsible project team member.
- Can produce realistic outcome in relation to project resources.

**Contents:**

Starting lecture, where the steps of carrying out the course will be described together with allocating the project assignments to project teams. The project work will take about two periods (one semester.)

**Learning activities and teaching methods:**

Project work 300h

**Target group:**

GS <sup>3</sup>D and exchange Master's level students, compulsory

**Recommended optional programme components:**

Mandatory predecessors: B.Sc. degree or other equivalent degree. Students enrolling directly to the master's programme should take the Basic of Project Work and Management (811108P) course first.

**Recommended or required reading:**

Unique project material to be collected by the project customer and/or material to be researched by the project team.

**Assessment methods and criteria:**

Project management skills will be reported in a project portfolio. Detailed criteria for evaluation will be given at the starting lecture.

**Grading:**

Every member of a project team will get the same grade (scale 1–5).

**Person responsible:**

Tonja Molin-Juustila

## 813621S: Research Methods, 5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tero Vartiainen

**Opintokohteen kielet:** English

**Leikkaavuudet:**

521146S Research Methods in Computer Science 5.0 op

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, period 2 and spring semester, period 3

**Learning outcomes:**

**Objective:** The course gives an introduction to general scientific research principles and the empirical research methodology of computer science, information systems and software engineering research. In the course, the three main research approaches applied in the field are presented: qualitative, quantitative and constructive research. These approaches are introduced with examples of more specific research methods. The course is especially intended for supporting Master's thesis research.

**Learning Outcomes:** After completing the course, the student knows the general principles of scientific research and the practices of scientific methodology. He/she can identify and describe the main research approaches and choose the appropriate one for his/her research problem. The student can apply basic research methods and search for more information for learning and applying new research methods. He/she is also able to evaluate the methodological quality of a research publication.

**Contents:**

**Contents:** Introduction to general scientific principles, inference and methodology, scientific research practices and quality of scientific publications, qualitative research approaches and selected research methods, quantitative research approaches and selected research methods, constructive research approaches and selected methods, requirements and examples of Master's theses.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 40h, exercises 30h and individual work 65h

**Target group:**

**Target group:** all Master's level and GS<sup>3D</sup> students, compulsory

**Recommended optional programme components:**

**Prerequisites:** B.Sc. degree or other equivalent degree.

**Recommended or required reading:**

**Study materials:** Lecture slides and specified literature

**Assessment methods and criteria:**

**Assessment methods:** Learning diaries/essays/exam and exercises

**Grading:**

Pass/fail

**Person responsible:**

Tero Vartiainen

## 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup>-2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 28–34h, an exam 25h, a group work 30h, course assignments and independent work 50.5–44.5h.

**Target group:**

**Target group:** Master's level students (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic understanding of the software business is of advantage.

**Recommended or required reading:**

**Study materials:** Refer to the course web pages.

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam.

**Grading:**

1-5

**Person responsible:**

Marianne Kinnula (marianne.kinnula@oulu.fi)

## **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<sup>st</sup> year of Master's studies; 2011-2012 spring semester, period 4; 2012 fall semester, period 1; in the following years the course will be implemented during the fall semester.

**Learning outcomes:**

After completing the course, the student

- Can define the key success factors of the 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 teaching 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 (article presentations and acting as opponents) for groups of 4 students. Study groups with groups of 8 students using case-based teaching method. Communication between exercise groups is done over the internet.

**Learning activities and teaching methods:**

Lectures and seminars involving all the students 30h and 30 h of reading (in English), study groups involving 8 students 20h, and exercises 50h. During the seminars a team of 4 students will present a selected research article and another team of 4 students will act as opponents. In the study groups a relevant teaching case from industry is discussed with the students. Each student will prepare a written analysis of the case before the discussion and a reflective analysis after the discussion. 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.

**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 (20%), lecture assignments (30%), study groups (10%), exercises (40%).

**Person responsible:**

Jouni Similä

**Working life cooperation:**

No

**Other information:**

Participation: The course is obligatory for GS<sup>3</sup>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

**Opintokohteen kielet:** English

**ECTS Credits:**

4 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's and GS<sup>3D</sup> studies, autumn semester, period 2

**Learning outcomes:**

**Objective:** The course gives an introduction to fundamental software engineering management, measurement and improvement concepts, methods and techniques in traditional, agile and lean development. The course covers both principles as well as current trends in software processes. The teaching is supplemented with examples from practical software engineering.

**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:**

**Contents:** The course covers the most fundamental process centred software quality improvement approaches, methods and latest research results. The topics of the course include: software processes, quality and quality standards, organisational level quality, process quality, process improvement approaches, software process and product measurement, agile and lean methods, quality improvement in company level and practical examples from the software industry.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, study group working 25h, paper reading 25h, exercises 15h, report writing 20h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS<sup>3D</sup> students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation but has been initially planned to be:

- 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

**Assessment methods and criteria:**

**Assessment methods:** Report evaluation

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Burak Turhan

## 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:** Oivo, Markku Tapani

**Opintokohteen kielet:** English

**ECTS Credits:**

7 ECTS

**Timing:****Timing:** 2<sup>nd</sup> year, autumn semester, periods 1+2**Learning outcomes:**

**Objective:** Students will study the most essential and current research topics in software engineering (SWE). Students will also learn practices of scientific communication in the SWE community, the structure of research papers, to critically read research papers and to analyse the content of the papers and the research methods used in the papers. Students learn to present research papers and give constructive criticism in an academic environment. The knowledge and skills learned in this course will give a solid basis for starting a Master's thesis.

**Learning Outcomes:** After completing the course the student will have a good understanding of current research areas in SWE and the most important SWE research methods. The student 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:****Contents:** Research areas in software engineering, research methods**Learning activities and teaching methods:****Mode of delivery:** Lectures, assignments related to lectures, presentations, report. Lectures and seminars 42h, assignments 160h, report 60h. Total 185h.**Target group:****Target group:** Master's level students in SE Oriented Module (compulsory), Master's level students in IS Oriented Module (optional) and GS<sup>3</sup>D students (compulsory, if not take course "Information Systems Theory")**Recommended optional programme components:****Prerequisites:** B.Sc. or other equivalent degree**Recommended or required reading:****Study materials:** Wohlin C., Runeson P., Höst M., Ohlsson M., Regnell B., Wesslen A., Experimentation in Software Engineering, Kluwer Academic Publishers, 2000, lecture material <http://www.tol.oulu.fi/index.php?id=998>**Assessment methods and criteria:****Assessment methods:** Assignments related to lectures, report**Grading:****Grading:** 1–5**Person responsible:****Responsible person:** Markku Oivo**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:** Tero Vartiainen**Opintokohteen kielet:** English**ECTS Credits:**

5 ects

**Language of instruction:****Language of instruction:** English**Timing:****Timing:** 1<sup>st</sup> year of Master's and GS<sup>3</sup>D studies, autumn semester, period 1**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 a variety of techniques.

**Learning Outcomes:** After completing the course, a student understands the complexity of business, organisational, technical, and human aspects that affect ISD and can select methods in ISD. The student also understands the defects of traditional waterfall model and how other methods aim to answer its defects and 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 an organisation into a coherent whole and to take into account job satisfaction issues in addition to efficiency demands in ISD in planning workflows in an organisation. The

student is also able to assess and give arguments as to which method is suitable for an ISD project in an organisation. In addition, the student understands the issues relating to managing global systems.

**Contents:**

**Contents:**

1. Information systems development (ISD)
2. The life cycle approach, waterfall model
3. Methodologies and techniques of ISD
4. Managing global systems

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, exercises 25h, homework 30h, essay 30h, examination 30h

**Target group:**

**Target Group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (compulsory)

**Recommended optional programme components:**

**Prerequisites:** Awareness and understanding of data modelling and object modelling in ISD

**Recommended or required reading:**

**Study materials:**

- Avison, D., Fitzgerald, G. (2006) Information Systems Development, methodologies, techniques & tools. Fourth Edition. London: McGraw-Hill.
- Laudon, K.C., Laudon, J.P. (2010) Management Information Systems, Managing the Digital Firm. Eleventh Edition. Upper Saddle River, New Jersey: Pearson Education. Chapter 15: Managing Global Systems.

**Assessment methods and criteria:**

**Assessment methods:** Examination and active participation in exercises.

**Grading:**

1-5

**Person responsible:**

Tero Vartiainen

## 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

**Language of instruction:**

English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The course aims to provide students with an understanding of the contemporary software business environment in mainland China and an appreciation of some of the implications for firms seeking to undertake software business there.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, assignment 60h, and exam 60. 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.

**Target group:**

**Target group:** all Master's level students and GS <sup>3</sup>D students, optional

**Recommended or required reading:**

**Study materials:** There is no prescribed textbook for this course. Instead, a reading brick comprising of 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:**

**Assessment methods:** 1) Exam (50%), 2) home assignment and in-class presentation (50%).

**Grading:**

1-5

**Person responsible:**

Xiaosong Zheng

## 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** The focus of the course is in the software development environments and tools for embedded platforms, such as Android, MeeGo, and PIC32. In addition, the course covers memory and power management, the core services of the platform, and the utilisation of existing libraries, such as Qt.

**Learning Outcomes:** After completing the course, a student can use the essential software development tools of a selected embedded platform, and is able to work with them. 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:**

**Contents:** The course covers various embedded software development platforms, such as Android, MeeGo, and PIC32. 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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures and exercises about 30h, exercise work about 75h

**Target group:**



**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Course "Real-time Distributed Software Development", C/C++ and/or Java programming skills or similar knowledge obtained from other courses.

**Recommended or required reading:**

**Study materials:** Course material, the documentation of selected technologies, and other related literature

**Assessment methods and criteria:**

**Assessment methods:** Exercise work

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Henrik Hedberg

## 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 3

**Learning outcomes:**

**Objective:** This course addresses the development and anticipation of emerging information technologies and issues related to the ICT industry and user organisations. Special emphasis will be given to understanding the developments related to the World Wide Web. The course will discuss the impact of the current social web and the future web on organisations and the ICT industry on multiple levels such as individual, social, organisational, economic and cultural. A global perspective on these emerging technologies and issues will be adopted in this course. The course provides students with methods and tools to evaluate and analyse technical, conceptual and managerial issues as well as strategic implications of emerging technologies and issues. The course may also potentially discuss forecasting methodologies including monitoring, trend analysis and scenario construction.

**Learning Outcomes:** After completing the course, the student is able to:

- Analyse the on-going changes in 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 of leveraging the technology to improve intra and inter-organisational processes and enhance a firm's competitive position;
- Develop his/her skills for building careers and taking advantage of entrepreneurial opportunities through emerging technologies; and
- Categorise and compare factors that influence how relevant an emerging technology will be in the long run.

**Contents:**

**Contents:**

- Development trends of the ICT industry and technology convergence, in particular related to the world wide web.
- What are emerging technologies; what has their economic and other impact been to date; what is their potential impact; projections of future impact?
- The creation and transformation of goods and services through emerging technologies (service science) and their impact on organisations, markets, industries and society.

- How is the web reshaping business and how can business leverage emerging technologies?
- Search for innovations.
- Understand concepts of business intelligence, market analysis, technology road mapping and scenarios.
- Future forecasting and research methods and theories of technological innovation and diffusion.
- Technological Trends: What innovations in the emerging technologies can we expect in the near future?  
Selected information technology trends: cloud computing, social media system, crowdsourcing, Web 3.0, etc.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures, exercises/seminars, course assignments, exam 27h lectures/exercises/seminars, 80h independent work.

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students

**Recommended optional programme components:**

**Prerequisites:** None

**Recommended or required reading:**

**Study materials:** Refer to the course web pages

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Harri Oinas-Kukkonen

## 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:** Tiikkaja, Marjo Kristiina

**Opintokohteen kielet:** English

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS <sup>3</sup>D studies, spring semester, period 4

**Learning outcomes:**

**Objective:** Modern information systems contain many vendor-supplied components that must be selected, integrated, tested, and installed. This course analyses current practices in systems integration, including enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), and data integration among others. Further, this course explores the impact of enterprise systems on work practices and the role of the systems in transforming global organisations and markets. This course also analyses companies and their information systems as a part of a larger business environment and business (process) networks, including communal organisations and societal services with state authorities and partner companies.

**Learning Outcomes:** After completing the course, the student:

- Is able to evaluate the processes used in a competitive environment;
- Is able to describe how processes integrate the internal functions of the firm and allow the firm to interact with its environment;
- Is able to recognise, model, and improve processes to achieve efficiency and compliance objectives;
- Understand the role of ERP, SCM, and CRM systems etc. as components of the enterprise architecture;
- Understand process development and lifecycle management;
- Is able to explain the impact of automation on work practices.

**Contents:**

**Contents:**

- A strategic view of processes; concepts of organisational efficiency and effectiveness
- Integrating the functional areas of the organisation

- Relating processes to the financial, customer, and product-oriented goals of the firm
- Supply chain management (SCM)
- Customer relationship management (CRM)
- Enterprise management systems (ERP)
- Collaborative systems
- Knowledge management systems

**Learning activities and teaching methods:**

**Mode of delivery:** The overall workload for each student in this course is 105 hours. The course will be arranged for the first time in 2011/2012, and a detailed plan of the course is not yet available. Therefore, the distribution of this 105-hour workload amongst the different parts of the course will be announced on the course webpage before the course starts.

**Target group:**

**Target group:** Master's level students of IS Oriented Module (compulsory), Master's level students of SE Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Understanding of the software business, business process modelling, legacy information systems and basics of accounting helps.

**Recommended or required reading:**

**Study materials:** Refer to the course webpages

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Marjo Tiikkaja

## 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's and GS <sup>3</sup>D studies, autumn semester, period 2

**Learning outcomes:**

**Objective:** The course will focus on information systems that relate to human behaviour change. Scientific articles on the topic will be discussed in the course. The course will help the student to recognise how the Web, mobile services and other IT systems can be, are being, and will be used to influence human attitudes and behaviour

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 27h, reflective personal exercises 24h, independent work 80h

**Target group:**

**Target group:** all Master's level and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Pre-requirements:** Understanding the roles of humans as users and developers of ICT

**Recommended or required reading:**

**Study materials:** Textbook, the web, to be announced more specifically during the course implementation

**Assessment methods and criteria:**

**Assessment methods:** Exam, personal exercise reports

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Harri Oinas-Kukkonen

## 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:** Anna-Liisa Syrjänen

**Opintokohteen kielet:** English

**ECTS Credits:**

4 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, period 3

**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 understands the role of human interaction with products and services and can identify factors and problems related to it in a practical 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 GUI design;
- Use interaction design methods to create a novel interface.

**Contents:**

**Contents:** The first part provides a broad overview of interaction design, introducing the key issues and activities of the subject, for example, 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 2 addresses a key activity in interaction design: that of establishing requirements for an interactive product, 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 4 presents the techniques and knowledge necessary to evaluate an interactive product.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20 h, assignment and tutoring 55 h and exam 30 h.

**Target group:**

**Target group:** Master's level students of the IS Oriented Module (compulsory), Master's level students of the SE Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:****Prerequisites:** none**Recommended or required reading:**

Study materials: Sharp, Rogers, Preece: Interaction Design: Beyond Human-Computer Interaction (2nd ed.), John Wiley 2007

**Assessment methods and criteria:****Assessment methods:** Exam 50 %, assignment 50 %**Grading:**

1-5

**Person responsible:**

Kari Kuutti / Anna-Liisa Syrjänen

**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

**Language of instruction:****Language of instruction:** English**Timing:****Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, periods 1 & 2**Learning outcomes:****Objective:** The course presents the theoretic background of real-time distributed systems, a model-based development methodology, and embedded, ubiquitous and mobile design examples.**Learning Outcomes:** After completing the course, the student:

- Is able to analyse the characteristic 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:****Contents:**

Introduction:

- Characteristics of Real-Time Systems
- Timeliness
- Resource management
- Safety and Reliability
- Concurrency
- Security
- Multitasking, Interrupts
- Scheduling
- Hardware Interfaces

Characteristics of Distribution

- Centralised
- Client-server
- Clusters
- Cloud
- Peer-to-peer

- Ad hoc
- Concept of time
- Synchronisation
- Latency and jitter
- Quality of Service
- Service Discovery
- Networking primitives
- Networking frameworks

Real-Time UML Modelling Methodology

Real-Time Design Patterns

Design Examples: Embedded, Ubiquitous, Mobile, Web/Internet

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 45h, Design exercises 15h, Student projects 100h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module and GS<sup>3D</sup> students (optional)

**Recommended optional programme components:**

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

**Recommended or required reading:**

**Study materials:** Lecture notes based on reference books

- Douglass B.P. (1999) Doing Hard Time – Developing Real-Time Systems with UML – Objects, Frameworks. And Patterns. Addison-Wesley ISBN 0-201-49837-5. 749 p.
- Douglass B.P. (2007) Real-Time UML – Advances in the UML for Real-Time Systems. 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.
- Douglass B.P. (2009) Real-Time Agility – The Harmony/ESW Method for Real-Time and Embedded Systems Development. Addison-Wesley ISBN 0-321-54549-4. 522 p.
- Douglass B.P. (2007) Real-Time UML Workshop for Embedded Systems. Elsevier. ISBN 978-0-7506-7906-0. 408 p.
- Comer D.E (2009) Computer networks and Internets. 5th edition. Pearson – Prentice Hall. ISBN 978-0-13-504583-1. 600 p.

**Assessment methods and criteria:**

**Assessment methods:** Exam and project evaluation.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Petri Pulli

## 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

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's and GS<sup>3D</sup> studies, spring semester, period 3

**Learning outcomes:**

**Objective:** The course gives an introduction to the core tasks of large-scale industrial software production and maintenance, focusing in software product line engineering, continuous integration/delivery and software maintenance.

**Learning Outcomes:** After completing the course, the student:

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

**Contents:****Contents:**

## Product line engineering

- Product line variability
- Domain engineering
- Application engineering

## Continuous integration/delivery

- Principles and practices of continuous delivery
- Ecosystem: automated testing, configuration management
- Implementing a deployment pipeline

## Software maintenance

- Categories of maintenance
- Process of software maintenance

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 32h, study group working 32h, report writing 44h

**Target group:**

**Target group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering and software architectures

**Recommended or required reading:**

**Study materials:** This list is preliminary. An updated list of study materials can be found in the course web pages.

- Pohl, K., Böckle, G., van der Linden, F. Software Product Line Engineering. Foundations, Principles, and Techniques, Springer-Verlag, 2005
- 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
- Duvall P., Matyas S., Glover A., Continuous integration – Improving software quality and reducing risks, Addison-Wesley, 2007
- Humble J., Farley D., Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, Addison-Wesley, 2011
- [Gopalaswamy, R.](#), Ramesh, B., Software maintenance: effective practices for geographically distributed environments, Tata McGraw-Hill, 2006 - [Computers](#) - 456 pages

**Assessment methods and criteria:**

**Assessment methods:** Exam and assignment report, exam can be replaced by study group work

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Samuli Saukkonen

**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

**Opintokohteen kielet:** English

**Leikkaavuudet:**

ay815311A Software Quality and Testing (OPEN UNI) 5.0 op

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** The course gives an introduction to software quality, software quality assurance and quality techniques, such as review, inspection and testing at different testing levels. Quality techniques will be taught with appropriate tools. The course also introduces current principles in test-driven development and test automation and models for reviewing and testing process improvement.

**Learning Outcomes:** After completing the course, the student can explain different views on software quality and use quality models for its assessment. The student can analyse the benefits and obstacles of reviews, inspection and testing as a part of software engineering and defect removal techniques. The student can conduct the review as part of a review team and use an appropriate supporting tool. The student knows testing levels, strategies and techniques, can create test cases and conduct unit testing, test driven development, integration testing and acceptance testing with appropriate testing tools. The student can also explain the benefits and obstacles of test automation and knows models for the reviewing and testing of process improvement.

**Contents:**

**Contents:** Software quality and quality assurance. Software reviews and inspection. Software testing. Test-driven development. Test automation. Reviewing and testing process improvement.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 30h, study group working 25h, paper reading 25h, exercises 25h, report writing 30h

**Target group:**

**Target Group:** Master's level students of SE Oriented Module (compulsory), Master's level students of IS Oriented Module (optional) and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation but has been initially planned to be:

- Galin D., "Software Quality Assurance: From theory to implementation", Addison-Wesley, 2004
- Mathur A.P., "Foundations of Software Testing", Prentice Hall, 2008
- Pezze M., Young M., "Software Testing and Analysis: Process, Principles and Techniques", John Wiley&Sons, 2008

**Assessment methods and criteria:**

**Assessment methods:** Report evaluation

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Burak Turhan

## 812671S: User Experience (UX) and Usability Evaluation, 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** This course gives an introduction to basics of designing and following through a usability testing process.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 24h, assignment tutoring 14h, assignment 90h, seminar 7h.

**Target group:**

**Target Group:** all Master's level and GS <sup>3</sup>D students, optional

**Recommended optional programme components:**

**Prerequisites:** Student is familiar with most common user interface design terms, design and evaluation methods as in "Introduction to Human-Computer Interactions" course.

**Recommended or required reading:****Study materials:**

- 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 methods:** Assignment, seminar

**Grading:**

**Grading:** Pass/fail

**Person responsible:**

Mikko Rajanen

**Other information:**

**Work placements:** No

## Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

### 300002M: Advanced Information Skills, 1 op

**Voimassaolo:** 01.08.2009 -

**Opiskelumuoto:** Other Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Sassali, Jani Henrik

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

1 ECTS credit

**Language of instruction:**

Finnish

**Timing:**

Recommend to degree students who are working on their diploma/master's thesis. The course unit is held once in the autumn and once in the spring semester.

**Learning outcomes:**

Students know the different phases of scientific information retrieval process and basic techniques of systematic information search. They will find the most important reference databases of their discipline and know how to evaluate information sources and search results.

**Contents:**

Scientific information retrieval, evaluation of search results and information sources, information search on subject areas of diploma/master's thesis.

**Mode of delivery:**

Blended teaching: lectures, web-based learning material and exercises in Optima environment, personal guidance

**Learning activities and teaching methods:**

Lectures 6h, self-study 20h, personal guidance 1h

**Recommended or required reading:**

Parts from the following chapters of the Toolbox of Research: <https://wiki oulu.fi/display/tor/1.1+Finding+scientific+information>  
<https://wiki oulu.fi/display/tor/1.3.1+Evaluation+based+on+academic+publishing>

**Assessment methods and criteria:**

Passing the course requires participation in the lectures (6h) and personal guidance and successful completion of the course assignments.

**Grading:**

pass/fail

**Person responsible:**

Science and Technology Library Tellus, tellustiето (at) oulu.fi

**Other information:**

<http://www.kirjasto oulu.fi/index.php?id=1250>

## 812650S: Advanced Topics in Human-Centred Design, 5 op

**Voimassaolo:** 01.08.2011 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Kuutti, Kari Pekka Tapani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ects

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** The course gives a research-oriented perspective on the state-of-the-art in human-centred design.

**Learning Outcomes:** After completing the course, students can evaluate the usefulness and efficiency of various specific methods and frameworks used in human-centred design, and they can use a specific framework or method to collect data and analyse it to provide novel information for design.

**Contents:**

**Contents:** The content of the course will change with time. The initial set of topics includes:

- The role of field studies in human-centred design;
- Post-cognitivist theories of interaction;
- Information ecologies and infrastructures;
- User experience as an object of analysis and design;
  - Participatory design, end-user-design and living labs.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 15h, assignments 100/115h, seminars 0/15h.

**Target group:**

**Target group:** all Master's level students and GS<sup>3D</sup> students, optional

**Recommended optional programme components:**

**Prerequisites:** Course "Interaction Design" or similar knowledge.

**Recommended or required reading:**

# Study materials: A collection of research papers supported with

# lecture materials. Students may also need to collect some study material by themselves.

## Assessment methods and criteria:

**Assessment methods:** Depending on the implementation group and/or individual assignments, evaluated according predefined evaluation criteria and in some implementations a participation activity may also be important.

## Grading:

**Grading:** 1–5

## Person responsible:

**Responsible person:** Kari Kuutti

## Other information:

Not implemented during academic year 2011–2012

## 817607S: Advanced Topics on Information Systems and Software Engineering, 8 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

## ECTS Credits:

5 ects

## Language of instruction:

English

## Timing:

1<sup>st</sup> - 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

## Learning outcomes:

**Objective:** This course deepens students' understanding of information security management. To be more precise, the aim is to make students understand and evaluate the key research results in the area of information security management, and also train them so that they can reflect and use empirical research findings in the area of the course in their later career.

**Learning Outcomes:** After completing the course, the students understand the seminal and state-of-art research results in the area of information security management. They are able to read and evaluate state-of-the-art research in the area of information security management, and are able to apply this knowledge (research results) to practical problems in the area of information security management.

## Contents:

The course is structured into 10 areas of information security, such as development of security policies, information security economics, and employee compliance with information security policies. Each area contains a set of key journal articles, which are discussed during the lecture. Each participant develops a seminar on a topic of information security management, which is presented during this course (ideally, students can use this work for their Master's thesis).

## Learning activities and teaching methods:

lectures 27h and seminars 21h, students' own work (writing seminar article)

## Target group:

All Master's level students and GS <sup>3</sup>D students, optional

## Recommended optional programme components:

Course "Information Security Policy and Management in Organisations", or similar knowledge obtained from other courses.

**Recommended or required reading:**

Articles (to be announced later)

**Assessment methods and criteria:**

Examination

**Grading:**

1-5

**Person responsible:**

Mikko Siponen

**Other information:**

Not implemented during academic year 2011-2012

**813618S: Application/Software/Service Package-based Information Systems Development, 5 op**

**Voimassaolo:** 01.08.2011 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Iivari, Pekka Toivo Juhani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** The objective is to get students acquainted with information systems development in situations in which a significant part of an information system is implemented using existing software packages, components and services.

**Learning Outcomes:** After completing the course, the student is aware of existing research into application /software/service package-based IS development, is able to analyse major technological trends affecting the phenomenon, and understands opportunities and challenges of various forms of application/software/service package-based IS development. They are able to apply this knowledge and understanding to real world cases of application/software/service package-based IS development.

**Contents:****Contents (tentative):**

1. Existing technologies of application/software/service package-based IS development;
2. Application package-based IS development;
3. Enterprise Resource Planning system-based IS development and implementation;
4. Service-oriented IS development;
5. Systems development methods for application/software/service package-based IS development;
6. Seminar (student presentations).

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h and student assignments (e.g. technology reviews and analyses of real world cases of application/software/service package-based IS development). Visitors from companies with practical experience with application/software/service package-based IS development may give lectures too.

**Target group:**

**Target group:** all Master's level students and GS<sup>3</sup>D students, optional

**Recommended optional programme components:**

**Prerequisites:** Course "Systems Design Methods for Information Systems" or equivalent knowledge.

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation

**Assessment methods and criteria:**

**Assessment methods:** To be determined during the course implementation

**Grading:**

Grading: 1–5

**Person responsible:**

Responsible person: Juhani Iivari

**Other information:**

Not implemented during academic year 2011–2012

**811336A: Collective capabilities and 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:**

1-4 ECTS

**Language of instruction:**

Finnish

**Timing:**

Free

**Learning outcomes:****Objective:** Recognising, sharing and development of collective capabilities within information processing studies and tutoring.**Learning Outcomes:** After completing the course, a student recognises and puts to the test proficiency in areas of information processing and aims to develop it in co-ordination with others.**Contents:****Learning activities and teaching methods:****Mode of delivery:** plan of action, organising and documenting tutoring, intermediate/end reporting and feedback session.**Target group:****Target group:** all Finnish Master's level students, optional**Recommended optional programme components:****Prerequisites:** Good knowledge on course areas selected for tutoring activity.**Recommended or required reading:****Study materials:** Literature of selected course area and tutoring.**Assessment methods and criteria:****Assessment methods:** Tutoring plan, intermediate and end reports.**Grading:**

Pass / fail.

**Person responsible:**

Anna-Liisa Syrjänen

**814602S: Design and Analysis of Computer Algorithms, 5 op****Voimassaolo:** 01.08.2011 - 31.10.2012**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Information Processing Science**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Juha Kortelainen**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

Language of instruction: English

**Timing:**Timing: 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1**Learning outcomes:**

**Objective:** To teach the fundamental techniques for designing and analysing computer algorithms. To present algorithms for solving real problems that appears in computer applications. To introduce the basic principles and techniques of computational complexity (worst-case / average-case time complexity, space complexity). To expose the main concepts and results of decision making and NP-completeness.

**Learning outcomes:** After completing the course, the student understands and internalises the phases that are needed when designing and analysing a computer algorithm. They are able to choose an appropriate design technique for a given simple problem, apply the chosen technique and specify the respective algorithm. Moreover, the student is capable of analysing the time and space complexity of the algorithm as well as its simplicity and generality. Finally they can implement the algorithm with a programming language.

**Contents:****Contents:**

1. Mathematical background
2. Asymptotic analysis
3. Divide and conquer algorithms
4. Greedy algorithms
5. Dynamic programming
6. Graph algorithms
7. NP-hard problems
8. Linear programming
9. Approximation algorithms
10. Randomised algorithms

**Learning activities and teaching methods:**

**Mode of delivery:** lectures 35h, exercises 35h, autonomous work 60h

**Target group:**

**Target group:** all Master's level and GS<sup>3</sup>D students, optional

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge in discrete mathematics, data structures and algorithms, rudimentary skills in programming.

**Recommended or required reading:****Study materials:**

1. Lecture notes
2. Lecture slides
3. Exercise materials
4. Text book: Steven S. Skiena: The Algorithm Design Manual, 2nd ed., Springer-Verlag, London, 2008.

**Assessment methods and criteria:**

**Assessment methods:** either two partial exams or a single final exam.

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Juha Kortelainen

**Other information:**

Not implemented during academic year 2011–2012

**816663S: Designing Secure Systems and Software, 5 op**

**Voimassaolo:** 01.08.2011 - 31.10.2012

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Mikko Siponen

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

Language of instruction: English

**Timing:**Timing: 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1**Learning outcomes:**

**Objective:** Students are aware (i) of the different methods for the development of secure systems and software, and (ii) their key strengths and limitations. In addition, students have a deeper understanding, obtained through lectures and hands-on exercises, of one method aimed at adding security to the information and systems development process.

**Learning Outcomes:** After completing the course, the student:

- Can use different methods for designing secure systems and software;
- Understands the strengths and limitations of these methods;
  - Can integrate these methods into information systems and software development methods.

**Contents:****Contents:**

1. Introduction to the development of secure systems;
2. Problems in the development of secure systems and software;
3. Brief overview of the different methods for the development of secure systems and software;
4. Strength and weaknesses of these methods;
5. Application of selected method(s) for the designing of systems and software by integrating them to the system development process.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 28h, and exercises 15h, reading for the examination and exercise work 85h.

**Target group:**

**Target group:** all Master's level students and GS<sup>3</sup>D students, optional

**Recommended optional programme components:**

**Prerequisites:** Course "Introduction to Information Security" or equivalent knowledge, a course on information system and software development

**Recommended or required reading:**

**Study materials:** Articles, to be announced later.

**Assessment methods and criteria:**

**Assessment methods:** Examination.

**Grading:**

**Grading:** 1–5.

**Person responsible:**

**Responsible person:** Mikko Siponen

**Other information:**

Not implemented during academic year 2011–2012

**817608S: Digital Service Innovation and Design, 5 op**

**Voimassaolo:** 01.01.2012 - 30.11.2012

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tuure Tuunanen

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

5 ECTS credits/134 hours of work

**Language of instruction:**

English

**Timing:**1<sup>st</sup> and 2<sup>nd</sup> year of Master's studies, spring semester, period 4

**Learning outcomes:**

After completing the course, the student:

- Will have good knowledge and understanding of research in the area of digital service innovation, co-creation, development, and design;
- Can acquire knowledge and read critically relevant research articles in some of the leading academic journals and conference proceedings;
- Can apply conceptual digital service development and design models and methods in practice;
- Can produce a digital service specification and a project plan for development;
- Can verbally present a business plan to a potential venture capital investor.

**Contents:**

1. Digital Service Innovation and Design Overview
2. A contemporary selection of research themes, such as:
  - Service-dominant logic for digital services;
  - Service modularity and digital services;
  - Business models for digital services;
  - Digital service development;
  - Discovering digital service needs;
  - Digital service modelling;
  - Digital service co-creation.

**Mode of delivery:**

Face-to-face teaching

**Learning activities and teaching methods:**

Lectures 1.5 ECTS credits (40.5h), class preparation 1 ECTS (26.7h), exercises 1.5 ECTS (40.5h), and final exam preparation 1 ECTS (26.7 h).

**Recommended or required reading:**

To be announced during the course implementation

**Assessment methods and criteria:**

Class Preparation:

Class Quizzes 15%

Exercises:

Group project Deliverable & Presentation 20%

Individual Assignment

15%

Final Exam

50%

**Grading:**

1-5

**Person responsible:**

Tuure Tuunanen

**Working life cooperation:**

No

**Other information:**

Course material can be found at OPTIMA e-learning environment.

*Compulsory***817608S-01: Digital Service Innovation and Design, exercise work, 0 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opintoehto kiellet:** English

Ei opintojaksokuvauksia.



**817608S-02: Digital Service Innovation and Design, exam, 0 op****Opiskelumuoto:** Advanced Studies**Laji:** Partial credit**Vastuuyksikkö:** Department of Information Processing Science**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Tuure Tuunanen**Opintokohteen kielet:** English

Ei opintojaksokuvauksia.

**811600S: Emerging Trends in Software Engineering, 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:**1st - 2<sup>nd</sup> year of Master's studies, autumn semester, periods 1+2**Learning outcomes:**

After completion of the course, the student can analyse and evaluate different research approaches on distributed and collaborative software engineering.

**Contents:**

Collaborative software development tools. Application knowledge management. Testing in distributed set-up. Process and metrics issues.

**Mode of delivery:**

Web-based lectures, face-to-face study groups

**Learning activities and teaching methods:**

Lectures 24h, study group working 40h, paper reading 40h, report writing 30h.

**Target group:****Prerequisites and co-requisites:**

Good general knowledge of software engineering practices.

**Recommended optional programme components:****Recommended or required reading:**

To be announced during the course implementation but initially planned to be:

- Mistrik I., Grundy J., van der Hoek A., and Whitehead J., Collaborative Software Engineering, Springer, 2010

**Assessment methods and criteria:**

Report evaluation.

**Grading:**

1-5

**Person responsible:**

Professors in software engineering

**Working life cooperation:**

No

## 811601S: Emerging Trends in Software Testing, 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

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** The course focuses on current emerging trends in software testing, including test-driven development, agile testing, model-based testing, test automation and test organisation.

**Learning Outcomes:** After completing the course, the student:

- Can analyse the benefits and obstacles of test-driven development;
- Can evaluate the major techniques of agile testing and major approaches in model-based testing;
- Can analyse the possibilities and limitations of test automation in the context of industrial software development.

**Contents:**

**Contents:** Test-driven development. Agile testing. Exploratory testing. Model-based testing. Test automation. Test organisation in software companies.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 24h, study group working 40h, paper reading 40h, report writing 30h

**Target group:**

**Target group:** all Master's level and GS<sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Basic knowledge of software engineering, Software quality and testing

**Recommended or required reading:**

**Study materials:** To be announced during the course implementation but initially planned to be :

- Crispin L., and Gregory J., Agile testing: a practical guide for testers and agile teams, Addison-Wesley, 2009
- Dustin E., Garrett T., Gauf B., Implementing Automated Software Testing, Addison-Wesley, 2009
- Utting, M., & Legeard, B., Practical model-based testing: a tools approach, Elsevier, 2007

**Assessment methods and criteria:**

**Assessment methods:** Report evaluation

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Ilkka Tervonen

**Other information:**

Not implemented during academic year 2011–2012

## 813614S: Information Processing and Collective Capabilities, 1 - 4 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Anna-Liisa Syrjänen

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

1-4 ECTS

**Language of instruction:**

Finnish

**Timing:**

Free

**Learning outcomes:**

**Objective:** Recognising, sharing and development of collective capabilities within information processing studies and tutoring.

**Learning Outcomes:** After completing the course, a student recognises and puts to the test proficiency in areas of information processing and aims to develop it in co-ordination with others.

**Learning activities and teaching methods:**

**Mode of delivery:** plan of action, organising and documenting tutoring, intermediate/end reporting and feedback session.

**Target group:**

**Target group:** all Finnish Master's level students, optional

**Recommended optional programme components:**

**Prerequisites:** Good knowledge on course areas selected for tutoring activity.

**Recommended or required reading:**

**Study materials:** Literature of selected course area and tutoring.

**Assessment methods and criteria:**

**Assessment methods:** Tutoring plan, intermediate and end reports.

**Grading:**

Pass / fail.

**Person responsible:**

Anna-Liisa Syrjänen

## 811168P-02: Information Security, exam, 0 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Basic Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Juha Kortelainen

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 811168P-01: Information Security, exercise work, 0 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Basic Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 813622S: Information Systems Evaluation, 5 op

**Voimassaolo:** 01.08.2011 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** livari, Pekka Toivo Juhani

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** Ex-post or post-mortem evaluation of IS (and software) projects is largely neglected in practice. As a consequence people and organisations do not effectively learn from past successes and mistakes. The purpose of the course is to change the mindset of future IS professionals in this respect and acquaint them with the methods and techniques of IS evaluation and related research.

**Learning Outcomes:** After completing the course, the student understands the significance of IS evaluation, knows existing research into IS evaluation and is able to analyse alternative IS evaluation approaches and frameworks. The student is able to apply this knowledge and understanding to real world cases of IS projects and IS applications.

**Contents:**

**Contents (tentative):**

1. Introduction.
2. Post mortem project reviews.
3. Frameworks for IS evaluation.
4. Evaluation criteria (of IS success and failure).
5. Exemplary cases of IS evaluation (especially from health informatics).
6. Student presentations.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 20h, student assignments (evaluating IS applications and ISD projects in practice) about 110h.

**Target group:**

**Target group:** all Master's level and GS<sup>3D</sup> students (optional)

**Recommended optional programme components:**

**Prerequisites:** Course "Systems Design Methods for Information Systems" or equivalent knowledge.

**Recommended or required reading:**

**Study materials:** To be announced later

**Assessment methods and criteria:**

**Assessment methods:** To be determined during the course implementation

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Juhani livari

**Other information:**

Not implemented during academic year 2011–2012

## 811359A: Mobile Systems Programming, 6 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Juustila, Antti Juhani

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

815308A Embedded Software Development Environments 4.0 op

**Timing:**

Period 2.

**Recommended optional programme components:**

Object Orientated Programming, Java

**Recommended or required reading:**

Study materials: Lecture notes, other material announced at the lectures.

**Person responsible:**

Antti Juustila

**813606S: Pro gradu thesis, 30 - 35 op**

**Voimassaolo:** - 31.07.2011

**Opiskelumuoto:** Advanced Studies

**Laji:** Diploma thesis

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

30 ECTS

**Language of instruction:**

**Language of instruction:** Finnish/English

**Timing:**

**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:**

**Objectives:** This is an integrating course of the curriculum and the specialisation programmes. Through the master's thesis the student will demonstrate his/her ability in scientific thinking, the use of scientific methods, familiarity in the research topic, and skills in scientific communication.

**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;
- Participate in the evolution of ICT and postgraduate studies.

**Learning activities and teaching methods:**

**Mode of delivery:** Conducting and reporting research under supervision of personal advisor.

**Target group:**

**Target group:** all Master's level and GS <sup>3</sup>D students, compulsory

**Recommended optional programme components:**

**Prerequisites:** The research plan and the final draft of the thesis will be presented in the "Master's Thesis Seminar" (813602S).

**Grading:**

**Grading:** The supervisor and a second independent reviewer will evaluate the thesis using the scale 1–5.

**Person responsible:**

**Responsible Person:** Professors of the department

**813605S: Pro gradu thesis (minor subject), 21 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** A,B,N,C,M,EX,L

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

21 ECTS

**Language of instruction:**

Language of instruction: Finnish

**Timing:**

free

**Learning outcomes:**

**Objectives:** This course is meant only for students having information processing science as a minor. It is an integrating course of the minor studies. With the thesis the student will demonstrate his/her ability in scientific thinking, the use of scientific methods, familiarity with the research topic, and skills in scientific communication.

**Learning Outcomes:** After completing the thesis the student can:

- Define a relevant focused problem in the field of information processing science;
- Apply scientific method as a tool in solving the stated research problem;
- Synthesise research results and evaluate their validity;
- Participate in the evolution of ICT and postgraduate studies.

**Learning activities and teaching methods:**

**Mode of delivery:** Conducting and reporting research under supervision of personal advisor.

**Recommended optional programme components:**

**Prerequisites:** The research plan and the final draft of the thesis will be presented in the "Master's thesis seminar" (813602S).

**Grading:**

**Grading:** The supervisor and a second independent reviewer will evaluate the thesis by using the scale 1–5.

**Person responsible:**

**Contact person:** Professors and other teachers/thesis advisors in the department.

**814660S: Program Correctness, 5 op**

**Voimassaolo:** 01.08.2011 - 31.10.2012

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Antti Siirtola

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

Language of instruction: English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** To understand the complexity of program analysis and the need for abstract models. To provide tools, both theoretical and practical, for the analysis of the correctness of sequential algorithms and concurrent systems. To advance conceptual and abstract thinking.

**Learning outcomes:** After completing the course, the student understands the complexity of program analysis and the need for abstract models and their connection to concrete software systems. S(he) can describe the concepts of partial and total correctness, denotational and operational semantics, and safety, liveness and fairness properties. Student is able to define and express algorithms using simple programming language and specifications in predicate logic, invent invariants for simple loops and apply proof rules to prove the correctness of simple programmes. S(he) can also model concurrent systems and their specifications as finite-state machines and construct larger systems from smaller parts. Student can choose an appropriate semantic model for the analysis and compare the system model against the specification.

**Contents:****Contents:**

1. Predicate logic,

2. Simple programming language,
3. Pre- and post-conditions, partial and total correctness,
4. Proof rules for program correctness,
5. Modelling using labelled transition systems,
6. Semantic models and correctness by refinement,
7. Concurrency,
8. Exploiting semantic equivalence and congruence

**Learning activities and teaching methods:**

**Mode of delivery:** lectures 40 hours, exercises 40 hours, autonomous work 70 hours

**Target group:**

**Target group:** Master's level students, optional

**Recommended optional programme components:**

**Prerequisites:** Good knowledge of programming, discrete structures, data structures and algorithms.

**Recommended or required reading:**

**Study materials:** 1. lecture slides, 2. exercise material, 3. text book: Michael Huth, Mark Ryan: Logic in Computer Science. Modelling and Reasoning about Systems (Chapters 1,2,4). Cambridge University Press, 2000. 4. article: Antti Valmari: The state explosion problem. Lecture Notes in Computer Science, Vol. 1491: Lectures on Petri Nets I: Basic Models, pages 429-528. Springer-Verlag, 1998.

**Assessment methods and criteria:**

**Assessment methods:** by taking either two partial exams or a single final exam

**Grading:**

**Grading:** on scale 1-5

**Person responsible:**

**Responsible person:** Antti Siirtola

**Other information:**

Not implemented during the academic year 2011-2012

## 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

**Opintokohteen kielet:** English

**ECTS Credits:**

5 ECTS

**Language of instruction:**

**Language of instruction:** English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** The course addresses starting and developing a software business. The course takes into consideration start-up businesses and already established businesses, as well as the software business on an industry-level. First, the course aims at familiarising the students with idea of business development in software start-ups, introducing the business plan concept. Second, the course aims at familiarising students with business development in established businesses by introducing different types of software business models and by discussing different software business case studies (success stories and failures). In this part, students will get to know the company-level business strategies and learn how different businesses within one company can be related to each other. Third, the course aims at familiarising the students with the dynamics of the software industry by introducing the concept of the software industry value network.

In summary, the course tries to consider the whole life cycle of business development, from developing the idea to having an established company that engages in several businesses at the same time, how the company is located in the industry value chain, and how the company can generate revenues with different types of business models.

**Learning Outcomes:** The course provides an understanding of business development on a business, company and industry level. After completing the course, the student is able to:

- Understand how business is being developed over the whole life cycle of the business and company;
- Conduct a market analysis;
- Conduct a business analysis;
- Identify different sources of financing for business operation;
- Understand and evaluate different strategic business options;
- Choose a business model adequate for the present and future situation of the company.

**Contents:****Contents:**

- Start-up point-of-view
  - The business idea
  - A business plan, and how to write it
  - Established businesses' point-of-view
    - Different types of software business models
    - Software business strategies
    - The software industry point-of-view
      - The software value network

**Learning activities and teaching methods:**

**Mode of delivery:** The overall workload for each student in this course is 133.5h. The course will be arranged for the first time in 2011/2012, and a detailed plan of the course is not yet available. Therefore, the distribution of this 133.5h workload amongst the different parts of the course will be announced on the course web pages before the course starts.

**Target group:**

**Target group:** Master's level and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Some knowledge about the software business, marketing and financing, as well as financial accounts is of advantage.

**Recommended or required reading:**

**Study materials:** Refer to the course web pages

**Assessment methods and criteria:**

**Assessment methods:** Participation in lectures/exercises/seminars, course assignments, exam

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Karin Väyrynen

**Other information:**

Not implemented during academic year 2011–2012

*Compulsory***813630S-01: Software Business Development, exercise work, 0 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Karin Väyrynen

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

**813630S-02: Software Business Development, exam, 0 op**

**Voimassaolo:** 01.08.2011 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Karin Väyrynen



**Opintokohteen kielet:** English

Ei opintojaksokuvauksia.

### **817603S-01: System Design Methods for Information Systems, exercise work, 0 op**

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tero Vartiainen

**Opintokohteen kielet:** English

Ei opintojaksokuvauksia.

### **817603S-02: Systems Design Methods for Information Systems, exam, 0 op**

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tero Vartiainen

**Opintokohteen kielet:** English

Ei opintojaksokuvauksia.

### **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

**Language of instruction:**

Language of instruction: English

**Timing:**

Timing: 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** The course will focus on the current and future web.

**Learning Outcomes:** After completing the course a student will have a deeper understanding of the essentials of the web. Moreover, he/she will be able to discuss and perhaps even to predict the potential future of the web. He /she will be able to apply the lessons learned for web design, organisational purposes and entrepreneurial activities.

**Contents:**

**Contents:** The course will help the student to recognise and reflect on ongoing 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 in the upcoming five years. Thus, the name of the course is The Next Generation of the Web.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 27h, independent work 100h

**Target group:**

**Target group:** All Master's level students and GS <sup>3</sup>D students (optional)

**Recommended optional programme components:**

**Prerequisites:** Course "Emerging Technologies and Issues" (recommended).

**Recommended or required reading:**

**Study materials:** Scientific articles, the web. More sources to be announced specifically during the course implementation.

**Assessment methods and criteria:**

**Assessment methods:** Student paper

**Grading:**

**Grading:** 1–5

**Person responsible:**

**Responsible person:** Harri Oinas-Kukkonen

**Other information:**

Not implemented during academic year 2011–2012

## 813352A: Usability Testing, 5 op

**Voimassaolo:** 01.08.2011 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Mikko Rajanen

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

5 ECTS

**Language of instruction:**

English

**Timing:**

**Timing:** 1<sup>st</sup> – 2<sup>nd</sup> year of Master's studies, autumn semester, period 1

**Learning outcomes:**

**Objective:** This course gives an introduction to basics of designing and following through a usability testing process.

**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:**

**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.

**Learning activities and teaching methods:**

**Mode of delivery:** Lectures 24h, assignment tutoring 14h, assignment 90h, seminar 7h.

**Target group:**

**Target Group:** all Master's level and GS <sup>3</sup>D students, optional

**Recommended optional programme components:**

**Prerequisites:** Student is familiar with most common user interface design terms, design and evaluation methods as in "Introduction to Human-Computer Interactions" course.

**Recommended or required reading:****Study materials:**

- 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 methods:** Assignment, seminar

**Grading:**

**Grading:** Pass/fail

**Person responsible:**

Mikko Rajanen