

STUDY GUIDE
2008–2009
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FACULTY OF INFORMATION SCIENCES

Master of Science degree programmes given in English

University of Tampere
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Faculty of Information Sciences

The Faculty of Information Sciences offers an excellent selection of fields of science which examine information from different points of view. The faculty produces research and education in the fields of Hypermedia, Information Studies, Mathematics, Computer Sciences and Statistics. The research and teaching in the faculty are aimed at fulfilling the increasing demands for information technology in modern society.

Faculty administration

All activities at the University of Tampere are governed by the Universities Act (645/1997) and the Universities Decree (115/1998) as well as the University of Tampere regulations. The decision-making body of the faculty is the Faculty Council and the Dean who is the chair of the council. A list of the members of the Faculty Council is available in the Faculty Office and on the faculty web-page. The university regulations define in detail the responsibilities of the Faculty Council and the Dean.

The Head of Faculty Administration and the Head of Study Affairs of the faculty prepare the issues discussed in the meetings of the Faculty Council and the issues which are decided by the Dean.

For more information on the Faculty please see <http://www.uta.fi/tiedekunnat/inf/english/index.html>.

Master's degree programmes offered in English

The Master's degree programmes given in English are offered by the Department of Computer Sciences in Computer Science and Interactive Technology.

Department of Computer Sciences

Department of Computer Sciences

Pinni B Building

Tel. (03) 3551 6616

Fax (03) 3551 6070

<http://www.cs.uta.fi/english/>

General information

The Department of Computer Sciences has an established and growing international reputation for research and teaching in Computer Science and Interactive Technology. The department has about 50 active researchers and is a close knit community that enjoys a stimulating intellectual environment. Both in teaching and research, our staff and students address issues of importance to the scientific community, business world and government agencies.

The department has more than 600 students studying undergraduate and postgraduate courses. We attract students from all over the world. Through our wide range of programmes (of which three can at the moment be studied in English) our students are offered a depth and breadth of knowledge, combined with strong technical skills. With the diversity and balance in the curriculum, the students are prepared for careers in both academic and industrial settings.

Research projects at the department concentrate in core areas of computer and information sciences. Database research develops effective means for storing and retrieving ever greater quantities of data. Other research is done to create new languages and tools for the making of computer programs. There is also a wide range of research projects on human-computer interaction, and many of the results achieved are ready for application in practice. Medical applications of Computer Science present a challenge for those researching algorithms and artificial intelligence. In research on information systems the focus of interest is on the benefits of information systems and their societal implications.

An exceptionally large number of IT companies operate in the Tampere region. The Department of Computer Sciences engages in various types of cooperation with them. In addition to joint research projects these companies have been a source of subjects for theses and practical projects.

Computer Science as a major subject

Computer Science is a field which examines questions pertaining to the use of computers, such as the principles and tools for the presentation and processing of data, programming and information systems and their planning. Professionals in this field must have the capacity for precise thought and logical deduction. The purpose of the programme is to train competent IT professionals, researchers and teachers for universities and colleges.

Interactive Technology as a major subject

Interactive Technology aims at training all-round IT professionals who have a people-friendly approach to their work. Making the quality of interaction better between man and technology is a core element in the teaching of Interactive Technology. Due to a multidisciplinary basis, students can utilise their backgrounds and interests and specialise in making software and hardware usability evaluations, or concentrate on developing new and better ways of interaction from a human perspective. Students can find jobs in a wide variety of different fields; they can become product development professionals in the software and telecommunications industry, usability experts in Internet and multimedia companies, and researchers in the field.

What the studies require

The studies require students to be able to apply learnt things and methods to new situations. Students must also have a fair share of perseverance. In working life professionals in this field must be able and willing to cooperate. Due to the rapid development of the IT branch, professionals must also be willing and able to acquire new information. Studying computer sciences requires students to be active, they have to complete the assignments given conscientiously, and practice independently and on their own initiative. The methods taught can only be learnt by completing weekly exercises. Even brief neglect of the studies will soon take its toll, and listening to lectures alone will not equip students with the necessary skills and competence.

For more information on the Department of Computer Sciences, please see <http://www.cs.uta.fi/english/>

Study counselling

Study counselling is given by the Master's degree programme tutor teachers and the International officer of the Faculty Office. For contact information please see below.

Programme tutor teachers

Dr. Zheyang Zhang (M.Sc. Programme in Software Development)
Pinni B Building, room B1034
Tel. (03) 3551 4045
Email zheyang.zhang (at) uta.fi

Dr. Poika Isokoski (M.Sc. Programme in User Interface Software Development; M.Sc. Programme in Interactive Technology)
Pinni B Building, room B1040
Tel. (03) 3551 8561
Email poika.isokoski (at) cs.uta.fi

Departmental amanuensis (study affairs)

Ms. Heli Rikala
Pinni B Building, room B1024
Tel. (03) 3551 8566
Email studies (at) cs.uta.fi

Faculty Office, International officer

Ms. Kirsi Tuominen
Pinni A Building, room A4038
Tel. (03) 3551 7036
Email kirsi.tuominen (at) uta.fi

General information on studies

1 Degree structure

A new degree system took effect at the Finnish Universities in August 2005. The extent of a degree is given in credits (in Finnish *opintopiste*). Finnish credits are ECTS compatible, i.e. **one Finnish credit corresponds to one ECTS credit**. The minimum requirement for a lower university degree, Bachelor's degree (=first cycle), is 180 credits. The extent of studies leading to a higher university degree, Master's degree (=second cycle), is 120 credits.

As of 1 August 2008 all students in the Faculty of Information Sciences - also those who started before 2005 - come under the new system and conduct their studies according to the new regulations. For more information on the degree structure reform, please see <http://www.uta.fi/studies/>.

Master's degree programmes given in English at the Department of Computer Sciences consist of three components:

- Advanced level courses in computer sciences 40 ECTS
- Master's thesis 40 ECTS
- Other studies 40 ECTS

2 Credits and workload

The Master's degree programmes offered are two-year programmes. The average input of 1600 working hours needed for studies of one academic year corresponds to 60 credits. The working hours include lectures, practical work, seminars, exercises, independent study, written examinations, and research. Thus, the credit system is based on a full student workload and is not limited to contact hours only.

3 Major subject

Master degree students have a major subject, in which scientific knowledge, theory and practice of the field are combined. At the final stage of their studies, students write a thesis based on independent research in a chosen area of the major subject.

4 Minor subjects, language studies and other studies

Studies in minor subjects can be included in the degree. They can be chosen from a faculty other than the one for which the student is accepted.

Depending on the degree programme, other types of studies (e.g. General Studies, Language and Communication Studies), are to be included in the degree. Studies complementing the existing degree may be required.

5 Study module

All courses taken by a student belong to a study module (*opintokokonaisuus*), which is the basic structural entity of the degree programme. The study modules are classified with respect to their contents and position in the curriculum as basic studies (*perusopinnot*), intermediate studies (*aineopinnot*) and advanced studies (*syventävät opinnot*). Study modules comprise a certain number of course units and they represent either one discipline or are interdisciplinary. The study modules usually range from 25 to 80 credits depending on the subject and the level of studies.

The main aim of the advanced studies (*syventävät opinnot*), is to develop the student's ability to seek and apply scientific knowledge.

Master programme courses in the major subject are on the advanced level. Some complementing studies on intermediate level may be required.

A large proportion of the master level studies is taken up by research. The Master's thesis is the most extensive single course unit.

6 Course unit

Study modules consist of course units. All instruction is planned, arranged and taken in course units. Course units carry a certain number of credits, usually from 3 to 10 credits. In most cases, one course unit consists of lectures, exercises and/or an exam. In addition to lecture courses and exercises, other forms of teaching are used, e.g. seminars, group work, practical work, written assignments, set book exams etc.

Once the student has taken all the course units within a certain study module, s/he should ask for a grade for the completed study module at the Department Office. Master programme students should ask for the final grade of their major subject studies after their Master's thesis has been assessed and graded.

Assessing course units

The evaluation scale for studies graded Pass is five-tiered. The grades are 1 (sufficient), 2 (satisfactory), 3 (good), 4 (very good), and 5 (excellent). For more information please see <http://www.uta.fi/studies/legislation/>.

7 Personal study plan HOPS

All students must make a HOPS plan, a written personal study plan to support the planning of the studies. In the Master degree programmes, the student writes the HOPS plan together with the programme tutor teacher, and the plans are monitored by the programme professor and the Faculty Office.

8 Queuing for a course place

If there are exercises, seminars or some other small group teaching where the number of study places has to be limited, the number of admitted students is to be decided in the programme requirements or teaching schedule.

If there are more students wishing to take a course than can be admitted, the priority is given to those who have registered in time and who have taken the prerequisite courses, and to those degree students on Bachelor and Master level for whom the course is compulsory. If there are still more students than can be admitted, the priority is given first to those who have taken more credits in the subject and secondly to those whose grades in the subject are better. If the situation is still unsolved, the priority is given first to those who have taken more credits in the major subject and secondly to those who have taken more credits in all their studies. Doctoral students are taken into account, if the course in question is listed in the Doctoral student's detailed HOPS plan accepted by the home department. Unclear cases are solved by the Head of Department.

If specific reasons are presented, the Head of Department may deviate from the above rules.

9 Exercise essay

One or more exercise essays may be written in the Master's programmes if required in the programme studies. The aim is to allow the student to exercise scientific writing and clear written expression. An exercise essay is written under the direction of the thesis supervisor and both the content and the language are examined. An exercise essay may be a part of the thesis.

10 Master's thesis

For the Master's degree, the student is required to write a Master's thesis in the major subject and a maturity test connected to the thesis. The Master's thesis is part of the advanced studies in the major subject, and it must show that the writer knows well the topic of the thesis, the required research methods and the ways to express scientific findings in writing.

The extent of the Master's thesis is 40 ECTS. The thesis may be written according to the following options:

- a monograph
- a collection of papers presented together with an introduction

An earlier published work may be accepted as a thesis provided that the work corresponds with the requirements that are set for the thesis.

If the thesis is written as group work, the independent part of each student must be made clear. The work load of each student must also equal that of a personal thesis. The thesis is examined by assessing the part of each individual student. A joint thesis may be written to combine two or more disciplines. Each discipline and each student will be appointed a separate examiner.

Submitting the Master's thesis

The thesis is submitted through the electronic service maintained by the University Library at <http://www.uta.fi/laitokset/kirjasto/tutkielmat/english/masterthesis.htm>. The service produces copies of the thesis for the examiners and for the University archives. More information is available at the Department of Computer Sciences at <http://www.cs.uta.fi/en/studies/thesisprocess.html>. The thesis is to be submitted with an abstract of 1-2 pages, giving information on the research question, material, methods used, and the most important results. More information on the abstract is available at the Department. If the programme studies include an exercise essay, it must be completed before the Master's thesis is submitted.

Maturity test

A maturity test based on the Master's thesis is compulsory for all degree students and it should be taken after the completion of the thesis. Students with Finnish/Swedish as the language of their elementary education write the test in Finnish/Swedish. If the elementary education has been taken in some other language, the maturity test is taken in English. Maturity test is a written examination, which is taken on a faculty examination day or some other day arranged with the department. Registration is done through the thesis supervisor in the same way one registers for a normal book examination. The registration is to be done a minimum of seven days before the test date unless the programme rules require differently. The test time is four hours.

The aims of the maturity test are to ensure that the student is well versed in the topic of the Master's thesis and scientific writing, and to verify that the student has written the thesis him/herself. The main examiner of the thesis prepares two or three questions, which are related to the theme of the thesis. The student should choose one of the questions and write an essay about the topic. The main examiner assesses the content of the essay. Language Centre of the University of Tampere checks the language used in the answer. More information is available at the Department of Computer Sciences at <http://www.cs.uta.fi/en/studies/thesisprocess.html>.

Assessing the thesis

A thesis is assessed and graded by a minimum of two examiners appointed by the Head of Department. The examiners' assessment is to be delivered three weeks after the date of the student's maturity test, unless the Head of Department has ruled otherwise. The assessment with the proposed grade is delivered to the student at least four days before the thesis is graded. At the same time, the student is given an opportunity to give a rejoinder against the assessment and the proposed grade. The rejoinder is to be delivered to the Department Office by the deadline given. If no rejoinder is given, the Department Council or the Head of Department grades the thesis using the examiners' assessment. A rejoinder is always discussed in the meeting of a Department Council. The student has the right to appeal against the grade also after the meeting of the Department Council, as the student may submit his/her rejoinder to the Department Council within fourteen (14) days of the date when the assessment was made known.

If the student is still not satisfied s/he may submit a rejoinder to the Faculty Council within fourteen (14) days of the date when the Department Council assessment was made known.

In the case of Master's thesis, the 7-tier grading scale in Latin (approbatur - laudatur) is used:

- L, laudatur (highest grade)
- E, eximia
- M, magna cum laude approbatur
- C, cum laude approbatur
- N, non sine laude approbatur
- B, lubenter approbatur;
- A, approbatur

The staff member introducing the assessment to the Head of Department takes the thesis and its grade to the UTA study register.

11 Degree diploma

After all the studies for the degree have been taken, the student is to submit an application to the Faculty Office for the degree diploma. The application is made using a form available in the Faculty Office or at <http://www.uta.fi/tiedekunnat/inf/>. The Dean grants the diploma. The student, before submitting the diploma application, can request a study transcript from the Faculty Office and use it to make sure that all the taken studies with their final grade have been registered. It is the responsibility of the student to make sure that all the studies are registered in the study register. The student must him/herself get the final grades (the number of credits and the grade of studies taken in the subject) from the departments. The final grade is needed of all the subjects in which the student has taken 15 ECTS credits or more.

In the Master's diploma, the number of credits and the grade of the advanced studies in the major subject are recorded.

A minor subject is recorded if the student has taken 15 ECTS or more. Minor subjects with less than 15 ECTS are recorded as 'Other studies'.

Language and communication studies are recorded as 'Language studies'.

12 Teaching schedules

This Study Guide gives the course and programme requirements but not the times and places of the tuition offered. University of Tampere teaching schedules are available at <http://www.uta.fi/studies/>.

13 Web tools: NettiOpsu

With the Basic User Account (BUA) students can browse their examination results, study record and change their contact information using the electronic NettiOpsu in the Internet. Through NettiOpsu, students can also enrol for examinations and some courses. It is also possible for a student to send a transcript of his/her academic records in pdf format to any e-mail address. NettiOpsu is available at <http://www.uta.fi/studies/nettiopsu/>.

14 Legislation related to studies

Finnish legislation together with UTA regulations for the evaluation of studies and regulations governing degrees can be found at <http://www.uta.fi/studies/legislation/>.

15 More information

For more information on studying please see the following:

University of Tampere <http://www.uta.fi/studies/>

Faculty of Information Sciences <http://www.uta.fi/tiedekunnat/inf/english/studies.html>

Department of Computer Sciences <http://www.cs.uta.fi/english/studies/>

Master's degree programmes given in English

Programme requirements

Objectives

Students complete the M.Sc. degree in one of the Master's programmes of the department.

The objective of the M.Sc. degree is to provide students with

- a thorough knowledge of the major subject and the basics of minor subjects;
- the ability to apply knowledge and scientific methods;
- the ability to work as an expert and developer in their field;
- qualifications for scientific postgraduate education; and
- good language and communication skills.

Further information

At the beginning of master's degree studies, each student makes a personal study plan in which the studies to be included in the master's degree are agreed upon in writing with the professor in charge of the Master's degree programme.

Students who complete a Master's degree programme in English are required to take the majority (100 ECTS) of courses in their master's degree studies in English.

The faculty will give more detailed information on how those students who started their studies before autumn 2005 and those who have taken the Bachelor of Science degree according to the old degree requirements can transfer to study in a Master's degree programme under the new degree structure.

A Master's degree may include practical training in the intermediate studies level. Students who wish to include practical training in their Master's degree must agree on this in advance with the professor of the Master's degree programme.

The structure of each Master's degree programme is described below. The course units which are mentioned in section 0.2 of the degrees as prerequisites may also be substituted with courses taken elsewhere, e.g. at another University or in a Polytechnic if the content of the courses is equivalent.

Studies in the Master's programme are largely defined by fields of specialisation, but the different programmes have common courses as well. Even though studies on the advanced level are divided into different Master's programmes, it is also possible, and often recommended, to take advanced courses of other Master's programmes. Please note that all the courses in a Master's programme are not taught in English every year. Course units in the advanced studies level which can be included in each Master's degree programme are confirmed annually in the teaching schedule. More information of the Master's programmes in English can be found from the web page <http://www.cs.uta.fi/en/studies/mscprograms.php>.

M.Sc. Programme in Software Development

Objectives: To deepen students' knowledge of software development in its different areas: requirements management, design, implementation, and testing.

Content: Students who graduate from the Master's programme in Software Development have the abilities to participate in demanding and comprehensive software projects at different stages of the project and in various tasks. Software development is examined in all stages of its life cycle. Teaching will deal with different programming approaches, software design, and software architectures.

Recommended minor subjects include, for example, Mathematics, Information Studies, and Administrative Sciences

Prerequisites: Requirements for the lower academic degree

If a student does not meet these requirements, the equivalent studies must be taken as complementing studies.

0.1 A lower academic or a corresponding degree in the field of computer sciences or in a closely related field.

0.2 Previous studies must include or students must extend them to include as part of block 2 "Other studies in M.Sc. programme":

- 20 ECTS of mathematical studies (Mathematics, Statistics or Logic) including the course MATEP0 Discrete Mathematics
- TKOPA215 Data Structures
- TKOPA208 Programming Technique
- TKOPA213 Database Programming
- TKOPA12 Project Work
- a total of at least 90 ECTS of computer science

Further information: [International degree students are to take Orientation course 1 ECTS, Guided planning of studies 2 ECTS, Finnish language studies and Intercultural Communication studies, minimum 6 ECTS and English language courses 6 ECTS as part of their programme studies.]

1. Advanced courses in M.Sc. programme in Software Development 80 ECTS

Content: Advanced courses must be discussed with the professor in advance. Advanced studies consist of three parts:

1.1 Compulsory advanced courses in software development 30 ECTS including the courses:

- TKOPS118 Theory of Software Project Management, 3 ECTS (available in English)
- TKOPS117 Software Project Management, 6-12 ECTS (available in English)
- TKOPS301 Requirements Engineering, 5 ECTS (available in English)
- TKOPS407 Seminar "Software development", 4 ECTS (available in English)

The rest of the compulsory courses should be selected from the following courses:

- TKOPS106 Distributed Transaction Management, 6 ECTS (available in English)
- TKOPS114 Logic Programming, 10 ECTS
- TKOPS116 Software Architectures, 6 ECTS
- TKOPS119 Principles of Object-Oriented Programming Languages, 4 ECTS
- TKOPS400 Seminar, 2-10 ECTS
- TKOPS122 Software Agent Technology, 6 ECTS (available in English)
- TKOPS139 Software Product Line Engineering, 5 ECTS (available in English)
- TKOPS140 Testing, Security and Trust, 5 ECTS (available in English)

- TKOPS303 Metamodelling for Software Development, 5 ECTS (available in English)
- TKOPS124 Artificial Intelligence Programming, 6-10 ECTS
- TKOPS128 Computer Graphics, 10 ECTS
- TKOPS131 Research Project, 3-10 ECTS (available in English)
- TKOPS142 Selected Topics in Software Engineering, 2-6 ECTS (available in English)
- VTEKS301 Design and Development of Speech Interfaces, 8 ECTS (available in English)

1.2 Optional advanced courses in computer science 10 ECTS

These courses can be selected also from the advanced courses of other master's degree programmes which support software development.

1.3 Master's Thesis 40 ECTS with a topic related to a field of this M.Sc. programme.

1.1 Compulsory advanced courses in software development 30 ECTS

Content: Compulsory advanced courses in software development 30 ECTS including the courses listed below:

TKOPS118 Theory of Software Project Management 3 ECTS

Objectives: The objective of the course is to introduce the students to the initiation, management and tracking of software projects. The course prepares students to the practical Software Project Management -course. This book examination is a prerequisite to the Software Project Management -course.

Content: Management of software work and people. Management and specification of requirements. Project management. Estimation of work efforts and production costs. Risk management. Configuration management. Software quality. Different contract types. Software for project management.

Modes of study: Written exam + essay.

Further information on modes of studies: Book examination and two essays. The book examination should be negotiated with the person liable.

Persons in charge: Lecturer Timo Poranen.

Previous studies: Compulsory: TKOPA11 Software Engineering/Ohjelmistotuotanto, TKOPA12 Project Work.

Study materials / literature: 1. Hughes & Cotterell, Software Project Management, McGraw-Hill 2006.

2. Selected research articles.

Website: <http://www.cs.uta.fi/tosprm/>

TKOPS117 Software Project Management 6–12 ECTS

Objectives: The objective of the course is to familiarise students in practice with the initiation, management and supervision of a software project. During the course, actual software projects are defined and their implementation is managed and supervised. The course forms an imaginary software company with the course Project Work. Projects are implemented within the framework of this imaginary company.

Content: Management of software work. Specification and management of requirements. Project management. Estimation of work efforts. Risk management. Configuration management. Software quality.

Modes of study: Essay + project / practical work.

Further information on modes of studies: Active participation in defining and management tasks. Written exercises and their presentation in the class.

Persons in charge: Lecturer Timo Poranen.

Teaching methods: Lectures 20 h. Approx. 20 h of lectures and seminars

Previous studies: Compulsory: TKOPA11 Software Engineering/Ohjelmistotuotanto, TKOPA12 Project Work, TKOPS118 Theory of Software Project Management.

Study materials / literature: 1. Pressman, Software Engineering, A Practitioner's Approach, McGraw-Hill 2004;
2. Hughes & Cotterell, Software Project Management, McGraw-Hill 2006.

Website: <http://www.cs.uta.fi/pt/>

TKOPS301 Requirements Engineering 5 ECTS

Objectives: This course introduces the activities, concepts, and techniques needed in the eliciting, analyzing, documenting, validating, and managing requirements for complex systems. It explains how requirements development and management fits into a broader systems development process, and provides an understanding of the main challenges in requirements engineering.

Content: Stakeholder identification; requirements elicitation, analysis, documentation, and validation; change control; requirements traceability.

Modes of study: Written exam + exercise(s).

Further information on modes of studies: Active participation in the lectures, individual assignments, a group work, and exam.

Persons in charge: Assistant professor Zheyang Zhang.

Teaching methods: Lectures and group work presentations at the seminar.

Previous studies: Compulsory: TKOPA11 Software Engineering/Ohjelmistotuotanto.

Time: Period I

Study materials / literature: 1. Additional material will be given to students in the class.
2. Leffingwell, D. & Widrig, D., Managing Software Requirements: A Use Case Approach. Addison-Wesley 2003
3. Kotonya, G. & Sommerville, I., Requirements Engineering: Processes and Techniques. John Wiley & Sons 1998.

Website: <http://www.cs.uta.fi/re/>

TKOPS407 Seminar Software Development - Issues, Trends, and Research Directions 4 ECTS

Objectives: The seminars enable students to learn about topics which do not otherwise appear in the available courses; expose students to different topics and perspectives in software development; and help students identify the topic of their master theses. They will cover issues, trends, and recent developments in various areas of software development.

Content: This is a seminar course with different speakers from academia and industry who will talk on their areas of expertise. In addition, participants present their master thesis work or research in the seminar.

Modes of study: Participation in classroom work + essay.

Further information on modes of studies: Students do not have to attend all seminars, but must accumulate these assignments in order to get the credit units.

1. Attendance and summary: The student has to attend and summarize at least 5 guest talks (approx. 1-2 hours in each talk) which he attends. The 1-2 page summary should include what the speaker presented, student's own critical comments (at least half a page), and may include a summary or highlights of the class discussion. The summary must include the name of the talk, the date, and name of the speaker.

2. Thesis presentation: The student has to prepare for an approx. 20 slide (notated) of his master thesis work and present it in the seminar (approx. 40-60 minutes). The presentation and the slides should be agreed with the student's thesis supervisor and the course organizer. Instructions to prepare for presentation slides will be provided during the seminar.

Persons in charge: Assistant professors Zheyang Zhang and Eleni Berki, professor Jyrki Nummenmaa.

Teaching methods: The seminar will be arranged every other week throughout the whole academic year.

Website: <http://www.cs.uta.fi/~TKOPS407/>

The rest of the compulsory courses should be selected from these

TKOPS106 Distributed Transaction Management 6 ECTS

Objectives: The course provides understanding of basic problems with distributed transaction management and a set of solutions to those problems.

Content: Data distribution, replication, distributed locking, distributed commit, implementational issues.

Modes of study: Exercise(s) OR Written exam + weekly exercises.

Persons in charge: Professor Jyrki Nummenmaa.

Teaching methods: Lectures 12 h and exercises 4 h.

Website: <http://www.cs.uta.fi/dtm/>

TKOPS114 Logic Programming 10 ECTS

Objectives: The course familiarises students with the logic programming paradigm and its basic programming techniques. After the course students are able to construct demanding logic

programs using Prolog (the main logic programming language). After the course, students are able to take into account the factors related to the maintainability of a Prolog program as well as to its efficiency of processing and memory space utilisation.

Content: The structure of a logic program and the connection of logic programming to mathematical logic. Logic programming of relational databases and deductive databases. Programming of recursive data types. A general processing model for logic programs. Logic programming techniques. Prolog-processing and exerting influence on it. Prolog-programming techniques. Self modifying Prolog-programs.

Modes of study: In Finnish: Written exam + weekly exercises + exercise(s).

Further information on modes of studies: Written examination, a certain number of weekly exercises and three practise programs based on logic programming / Prolog.

Teaching methods: Lectures 39 h and exercises 24 h.

Previous studies: Recommended: TKO-PA215 Data Structures.

Time: Periods III, IV

Study materials / literature: Sterling-Shapiro, The Art of Prolog -Advanced Programming Techniques. The MIT Press 1994.

Website: <http://www.cs.uta.fi/logo/>

TKOPS116 Software Architectures 6 ECTS

Objectives: The course familiarises students with software architectures and their use. Object oriented software architectures and their implementations are presented in detail. Special emphasis is given to the reuse of design and implementation solutions, their modularity and flexibility.

Content: Software architectures, object oriented joining mechanisms, layered architectures, software components, design patterns, frameworks and distributed objects.

Modes of study: In Finnish: Exercise(s) + participation in classroom work.

Further information on modes of studies: Project work and active participation in exercises.

Teaching methods: Lectures 42 h and exercises 18 h. 42 h of lectures, exercises, instruction for project work.

Previous studies: Compulsory: TKOPA11 Software Engineering/Ohjelmistotuotanto, TKOPS119 Principles of Object-Oriented Programming Languages.

Study materials / literature: 1. Koskimies, Oliokirja. Satku - Kauppakaari 2000.

Website: <http://www.cs.uta.fi/ohar/>

TKOPS119 Principles of Object- Oriented Programming Languages 4 ECTS

Objectives: The course aims at giving students a comprehensive view of object oriented programming languages, their design principles and implementation mechanisms. In addition, some advanced topics in the Java language are introduced, such as thread control and parallel programming.

Content: The main topics are the basic concepts of the object paradigm and the mechanisms of object oriented programming languages that are related to them: object, class, single and multiple inheritance, polymorphism and dynamic binding. These mechanisms are examined in general and not only from the viewpoint of one language. The main language employed is Java, but languages such as Python and C++ are also used.

Modes of study: In Finnish: Written exam + exercise(s).

Teaching methods: Lectures 20 h and exercises 10 h.

Previous studies: Compulsory: TKOPA208 Programming Technique.

Study materials / literature: Koskimies, Oliokirja. Satku - Kauppakaari 2000.

Website: <http://www.cs.uta.fi/opok/>

TKOPS400 Seminar (Computer Science) 2–10 ECTS

Objectives: Command of the special questions examined in the seminar.

Content: The course deals with special questions concerning a specific field in computer science. The topics for the seminars are announced every semester on the notice board of the department and on the homepage of the department.

Modes of study: Seminar.

Further information on modes of studies: Active participation in project work.

Teaching methods: Seminar 30 h. 16-30 h of seminars

Study materials / literature: To be announced at the beginning of the seminar.

Further information: The amount of credits and requirements are announced at the beginning of each seminar.

Website: <http://www.cs.uta.fi/>

TKOPS122 Software Agent Technology 6 ECTS

Objectives: The goal of the course is to introduce the participants to principles of software agents. After taking this course the student is familiar with the possibilities of agent technology, solutions for implementation, and can evaluate the suitability of agent technology in a given design problem.

Content: The course is an introduction to software agent technology. The topics contain software agents (different definitions, architectures, and agent programming languages), agent-to-agent communication, platforms for software agents, ontologies, and applications of software agents.

Modes of study: Essay (independent study).

Further information on modes of studies: Weekly tasks and a paper.

Persons in charge: Professor Roope Raimo.

Teaching methods: Lectures 26 h. Guidance for paper writing.

Previous studies: Recommended: VTE-KA15 Introduction to User Interfaces.

Study materials / literature: 1. Lecture notes, selected journal articles and conference papers.

Further information: A student who already has credits from the course Software Agents cannot get credits from this course.

Website: <http://www.cs.uta.fi/sat/>

TKOPS139 Software Product Line Engineering 5 ECTS

Objectives: Students will learn the key processes such as domain engineering and application engineering, their activities, and underlining techniques for defining and managing software product-line components.

Content: Software product-line engineering is a paradigm for developing a diversity of software products and software-intensive systems based on the underlying architecture of an organizations product platform. The product variants can be derived from the basic product family, which creates the opportunity to reuse and differentiate on products in the family. This course discusses in detail the essential foundations, principles, and techniques of software product-line engineering. It covers the concepts of software architecture, component and system.

Modes of study: Participation in classroom work + project / practical work.

Further information on modes of studies: Lectures, student presentations, and a project work.

Students will work individually or together on a topic of software product-line engineering, write a report, and present it in class.

Persons in charge: Assistant professor Zheyang Zhang

Teaching methods: Lectures, and seminars. Students will work together on a topic of software product-line engineering, write a report, and present it in seminars. The number and

length of seminar sessions depend on the number of groups.

Time: Period IV

Study materials / literature: 1. Pohl, K., Böckle, G., van der Linden, F., Software Product Line Engineering: Foundations, Principles and Techniques. Springer 2005.

2. Additional readings will be distributed in class.

TKOPS140 Testing, Security and Trust 5–6 ECTS

Objectives: 1. To become acquainted with a variety of testing techniques and their inter-connection to the issues of security of software and trust in information systems.

2. To become aware of testing techniques, software tools and IS development methods that offer testing.

3. To examine a variety of case studies (Railways, Ariane-5, Nuclear Plants, Design of Olympic Games IS, Airline Flight Security, etc.) where testing was proved to be a critical factor.

Content: The course will refer to the following topics: Software Testing, Security, Trust in lifecycle development processes, Reliability, Correctness, Consistency and Completeness, Formal computational methods, Software Tools and their contribution to testing

Modes of study: Written exam + exercise(s).

Further information on modes of studies: Exam and coursework.

Persons in charge: Assistant professor Eleni Berki.

Teaching methods: Lectures/seminars based on the most definitive and classic pieces of work on testing and on recent research and development outcomes.

TKOPS303 Metamodelling for Software Development 5 ECTS

Objectives: The course discusses metamodelling and method engineering and their role in clarifying the systems development discipline, strategies for reuse in the metamodelling-based system development environment. It also covers issues related to developing domain-specific methods for product family development. This course provides students

hands-on experience in metamodelling using a metaCASE tool.

Content: Systems development, systems family engineering, modeling and metamodelling, domain-specific models, method engineering, CASE tools and metaCASE tools, reuse strategies in metaCASE tools and examples.

Modes of study: Written exam + exercise(s).

Evaluation: 1-5. Method analysis assignment (50%). Final examination (50%).

Persons in charge: Assistant professor Eleni Berki.

Teaching methods: Lectures 12 h. App. 12 hours of lectures and 6 hours of demos. In addition, students will work in group (2 person) to produce a written analysis of a part of a method and construct it using a metaCASE tool.

Previous studies: Basic knowledge of modeling for software development, the modeling methods, and the modelling tools.

Study materials / literature: A list of readings will be given to students.

Website: <http://www.cs.uta.fi/msd/>

TKOPS124 Artificial Intelligence Programming 6–10 ECTS

Objectives: The goal of this course is to provide an overview of various subfields of artificial intelligence through different programming techniques that are used in these fields. Artificial intelligence programming techniques are demonstrated through the logic programming language Prolog which is a prerequisite for this course.

Content: Definitions and applications of artificial intelligence and various programming techniques utilized in its subfields. Classification of Prolog-programming methods. Applications of these methods in central subfields of artificial intelligence. These subfields include problem solving, heuristic search, planning, knowledge representation, expert systems, natural language processing, machine learning and non-standard logics.

Modes of study: In Finnish: Weekly Exercises + essay + exercise(s).

Further information on modes of studies: Certain amount of the weekly exercises and

an essay (6 ECTS/3 cu). If students wish to be awarded 10 ECTS/5 cu for the course, they must carry out a programming assignment in addition to other requirements.

Persons in charge: Lecturer.

Teaching methods: Lectures 40 h and tutorials 16 h. 40 h of lectures, 16 h of exercises and instruction for project work.

Previous studies: Compulsory: TKOPS114 Logic Programming.

Study materials / literature: Lecture notes.

1. Sterling, L. Shapiro, S., The Art of Prolog - Advanced Programming Techniques. The MIT Press 1994
2. Poole, P., Mackworth, A., Goebel, R., Computational Intelligence: a logical approach. Oxford University Press 1998
3. Bratko, I., PROLOG Programming for Artificial Intelligence. Addison-Wesley 2000.

Website: <http://www.cs.uta.fi/aiome/>

TKOPS128 Computer Graphics 10 ECTS

Objectives: The main methods and theories of computer graphics are introduced. The aim is to gain a profound understanding of the basics of computer graphics.

Content: The course is mainly based on modern 3D picture processing. Representation, modelling and rendering of 3D objects, image spaces, shading, modelling of the interplay of light and object, mapping techniques such as textures, shadow algorithms, global illumination, anti-aliasing, colours and computer animation are also described.

Modes of study: In Finnish: Written exam + exercise(s).

Teaching methods: Lectures 48 h and exercises 20 h. The course may be taught also in English.

Previous studies: Compulsory: TKOPA215 Data Structures. Basic studies in Mathematics recommended.

Study materials / literature: 1. Foley, van Dam, Feiner, Hughes, Computer Graphics: Principles and Practice. Addison-Wesley 1990

2. Watt, A., 3D Computer Graphics. 2000.

Website: <http://www.cs.uta.fi/tkgraf/>

TKOPS131 Research Project 3–10 ECTS

Objectives: To familiarise students with some specific field of computer science and with research methods used in the field. Practice of research work.

Content: During the course, a given field of computer science is researched. The aim is to publish the findings as a research report.

Modes of study: Project / practical work.

Further information on modes of studies: Active participation in project work.

Persons in charge: Professor.

Previous studies: Compulsory: TKOPA13 Introduction to Research Methods. and possibly other courses depending on the subject of the project.

Time: Periods I, II

Website: <http://www.cs.uta.fi/tupro/>

TKOPS142 Selected Topics in Software Engineering 2–6 ECTS

Objectives: The main objective of the course is to introduce concepts and approaches that can be generally expected to be known in software engineering research. In addition, the course contains some guidance in writing research articles and theses.

Content: The lectures are composed of brief tutorials and overviews in the focal topics of software engineering, given by experts in their fields.

Modes of study: Study journal / learning diary.

Persons in charge: Professor Roope Raisamo.

Teaching methods: Lectures 16 h. The size of the course is 2-6 ECTS depending on how many lectures the student takes. The course is expected to be continuous with new topics in the schedule in the Fall of 2008.

Time: Periods I, II, III, IV

Website: <http://www.cs.uta.fi/~rr/SoSE/STSE/>

VTEKS301 Design and Development of Speech Interfaces 8 ECTS

Objectives: To learn the characteristics of human speech and communication, the processing of speech by computers, and the successful use of speech in human-computer interaction to construct working speech applications.

Content: Human factors in speech technology. The nature of sound and language. Speech recognition and synthesis. Speech and non-speech audio. Dialogue management. Prompt design. Error management. Data collection and evaluation methods. Interfaces for speech technology components, description languages and formalisms, speech application architectures, tools and development tools. Implementation and evaluation of speech applications.

Modes of study: Project / practical work.

Further information on modes of studies: Assignments and a documented project work.

Persons in charge: Docent Markku Turunen

Teaching methods: Lectures web-based 40 h. On-line material and assignments. No obligatory meetings, suitable for distant learning.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces.

Study materials / literature: 1. McTear, M., Spoken Dialogue Technology: Towards the Conversational User Interface. Springer 2004.

Further information: The course includes courses "Speech User Interface Project Work" and "Speech Interface Design". You cannot get credits if you have completed these courses. See course homepage for more details.

Website: <http://www.cs.uta.fi/ddsi/>

1.2 Optional advanced courses in computer science 10 ECTS

Content: These courses can be selected also from the advanced courses of other Master's degree programmes which support software development.

1.3 Master's Thesis with a topic related to a field of this M.Sc. programme 40 ECTS

TKOPS901 Master's Thesis (Computer Science) 40 ECTS

Objectives: The student composes independently a thesis on a topic related to the field of the Master's programme and demonstrates his/her familiarity with the topic of the thesis, command of the required research methods and ability to write scientific texts.

Content: Independent research on a subject that must be agreed upon with a professor in computer science or with another instructor.

Modes of studies: Master's thesis and maturity exam.

Persons in charge: Professor.

Teaching methods: Personal tutoring upon agreement.

Recommended year of study: The Master's Thesis is usually written at a later stage of studies.

Website: <http://www.cs.uta.fi/english/studies/>

2. Other studies in M.Sc. programme 40 ECTS

Please see below.

M.Sc. Programme in User Interface Software Development

Objectives: To deepen students' knowledge of Computer Science and especially software development with regards to human-technology interaction. To give students a solid basis for working in the fields of product development and research, which include the design and implementation of user interfaces. In addition, the programme provides students with tools for studying human-computer interaction from a constructivist approach.

Content: After graduation, students in the M. Sc. Programme in User Interface Software Development can work as software designers or in tasks requiring design and implementation of user interfaces, or they can become researchers in companies or universities that study the interaction between humans and technology and develop innovative solutions to different kinds of problems concerning user interfaces. One of the main goals is becoming familiar with new ways of interaction and the implementation of user interfaces based on them. Each student is able to specialise in different topics by choosing advanced courses in Interactive Technology and Computer Science that belong to the Master's degree programme in User Interface Software Development. It is possible to specialise in topics such as new learning environments, computer-aided groupware, software agents, speech interfaces, haptics or new interaction and visualisation techniques. There is also teaching in human-technology interaction in the Master's Programme in Interactive Technology, in which implementation skills are not emphasised.

Recommended minor subjects include, for example, Mathematics, Psychology, Linguistics, Hypermedia, Information Studies, Education and Statistics

Prerequisites: Requirements for lower academic degree

If a student does not meet these requirements, the equivalent studies must be taken as complementing studies.

0.1 A lower academic or a corresponding degree in the field of computer sciences or in a closely related field.

0.2 Previous studies must include or students must extend them to include as part of block 2 "Other studies in M.Sc. programme":

- MATEP0 Discrete Mathematics (see curriculum of Mathematics)
- TKOPA215 Data Structures
- TKOPA208 Programming Technique
- TKOPA12 Project Work
- VTEKA15 Introduction to User Interfaces
- TKOPA223 Principles of Programming Graphical User Interfaces
- a total of at least 90 ECTS of Computer Science and Interactive Technology

Further information: [International degree students are to take Orientation course 1 ECTS, Guided planning of studies 2 ECTS, Finnish language studies and Intercultural Communication studies, minimum 6 ECTS and English language courses 6 ECTS as part of their programme studies.]

1. Advanced courses in M.Sc. programme in User Interface Software Development 80 ECTS

Content: Advanced courses must be discussed with the professor in advance. Advanced studies consist of three parts:

1.1 Compulsory advanced courses in user interface software development, at least 24 ECTS from the following core courses:

- VTEKS301 Design and Development of Speech Interfaces, 8 ECTS (available in English)
- VTEKS115 Introduction to Information Visualization, 3 ECTS (available in English)
- VTEKS112 Information Visualization Project Work, 5 ECTS (available in English)

- VTEKS101 Groupware, 3-6 ECTS (available in English)
- VTEKS105 New Interaction Techniques, 5 ECTS (available in English)
- VTEKS213 Haptic User Interfaces, 5-8 ECTS (available in English)
- VTEKS114 Implementation of New Interaction Techniques, 10 ECTS (available in English)
- VTEKS106 Research Project in Human Computer Interaction, 6 ECTS (available in English)
- VTEKS116 Book exam in Interactive Technology (with suitable topic), 4-12 ECTS (available in English)
- TKOPS116 Software Architectures, 6 ECTS
- TKOPS122 Software Agent Technology, 6 ECTS (available in English)
- TKOPS124 Artificial Intelligence Programming, 6-10 ECTS
- TKOPS115 Neurocomputing, 10 ECTS
- TKOPS128 Computer Graphics, 10 ECTS
- VTEK /TKOPS400 Seminar (with suitable topic)

1.2 Optional advanced courses in computer science 16 ECTS

These can be selected from the previous list 1.1 and from the advanced courses of other Master's degree programmes in Computer Science or Interactive Technology.

1.3 Master's Thesis 40 ECTS with a topic related to a field of this M.Sc. programme.

1.1 Compulsory advanced courses in user interface software development 24 ECTS

Content: Compulsory advanced courses in user interface software development, at least 24 ECTS from the following core courses:

VTEKS301 Design and Development of Speech Interfaces 8 ECTS

Objectives: To learn the characteristics of human speech and communication, the processing of speech by computers, and the successful use of speech in human-computer interaction to construct working speech applications.

Content: Human factors in speech technology. The nature of sound and language. Speech recognition and synthesis. Speech and non-speech audio. Dialogue management. Prompt design. Error management. Data collection and evaluation methods. Interfaces for speech technology components, description languages and formalisms, speech application architectures, tools and development tools. Implementation and evaluation of speech applications.

Modes of study: Project / practical work.

Further information on modes of studies: Assignments and a documented project work.

Persons in charge: Docent Markku Turunen

Teaching methods: Lectures web-based 40 h. On-line material and assignments. No obligatory meetings, suitable for distant learning.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces.

Study materials / literature: 1. McTear, M., Spoken Dialogue Technology: Towards the Conversational User Interface. Springer 2004.

Further information: The course includes courses "Speech User Interface Project Work" and "Speech Interface Design". You cannot get credits if you have completed these courses. See course homepage for more details.

Website: <http://www.cs.uta.fi/ddsi/>

VTEKS115 Introduction to Information Visualization 3 ECTS

Objectives: After this course, the students will have an overview of the field of information visualization and its place in the general context of human-computer interaction and related fields. The students will be familiar with the central theories of information visualization, the historical developments in the field and the seminal research.

Content: The course introduces selected topics in information visualization. The topics include, but are not limited to, the following: models and theories of information visualization, visualization techniques, interaction in information visualization, and human factors in information visualization.

Modes of study: Exercise(s) + study journal / learning diary.

Further information on modes of studies: Active participation in the lectures and assignments.

Persons in charge: Researcher Harri Siirtola

Teaching methods: Lectures 24 h.

Previous studies: Compulsory: TKOPA13 Introduction to Research Methods. Or equivalent skills.

Study materials / literature: 1. In addition to selected research articles.

2. Ware, C., Information Visualization: Perception for Design. Morgan Kaufmann 2004

3. Spence, R., Information Visualization: Design for Interaction, 2nd edition. Prentice Hall 2007.

Further information: This course was previously a part of the course Information Visualization (Tiedon visualisointi). This course cannot be taken by students who have taken the previous course.

Website: <http://www.cs.uta.fi/invisu/>

VTEKS112 Information Visualization Project Work 5 ECTS

Objectives: After this course, the student will be familiar with the state-of-the-art information visualization design methodology, and has the necessary skills to design, implement and evaluate information visualization applications. The student will also be familiar with current visualization application development and prototyping frameworks.

Content: The course consists of lectures and a project work. The main focus is on carrying out the information visualization design project. The project work is carried out in small groups and the results are presented in a seminar to the whole class.

Modes of study: Project / practical work + participation in classroom work + seminar.

Further information on modes of studies: Active participation in the lectures, project work and presentation of the project work.

Persons in charge: Researcher Tomi Heimonen.

Teaching methods: Lectures 10 h and seminar 4 h.

Previous studies: Recommended: TKO-PA223 Principles of Programming Graphical User Interfaces. Compulsory: VTEKS115 Introduction to Information Visualization, TILTP1 Introduction to Statistics. Or equivalent skills.

Study materials / literature: 1. Spence, R., Information Visualization: Design for Interaction, 2nd edition. Prentice Hall 2007.

2. Selected research articles related to the themes of the course.

Further information: Previously partially included in the course Information Visualization (Tiedon visualisointi). This course cannot be taken by students who have taken the previous course.

Website: <http://www.cs.uta.fi/ivpro/>

VTEKS101 Groupware 3–6 ECTS

Objectives: After the course, the student knows about the challenges in providing technology support for groups, teams, online communities and networks of people. The student will study special topics of the field in a small group using modern groupware applications. In addition to the central concepts of the field introduced in research literature, the student will gain a practical understanding of the usability of current groupware applications in certain group situations. The student learns different approaches in the evaluation of groupware, and can discuss their drawbacks and benefits in real world situations.

Content: Definitions of groups and groupware. Examples of synchronous and asynchronous groupware and social computing for computer mediated communication, computer conferencing and group meetings. Recommender systems, social networking and user interface design for social navigation and awareness. Supporting groups in ubiquitous environments. Tools for group work, for instance group writing and drawing. Usability of groupware. Privacy issues.

Modes of study: Written exam + project / practical work + participation in classroom work.

Further information on modes of studies: Active participation in lectures, and open

book examination. Participation in group work project and group presentations.

Persons in charge: Lecturer Salla Ovaska.

Teaching methods: Lectures 20 h and seminar 10 h. Lectures, face-to-face and electronic meetings in small groups, collecting and comparing experiences in using groupware in small groups, group essay and group presentations.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces, TKOPA13 Introduction to Research Methods.

Time: Periods III, IV

Study materials / literature: 1. Research papers on CSCW and Groupware (will be specified yearly).

2. Baecker, Readings in Groupware and Computer-Supported Cooperative Work. Morgan Kaufmann 1993.

Website: <http://www.cs.uta.fi/gw/>

VTEKS105 New Interaction Techniques 5 ECTS

Objectives: After this course the student has an overview of some active research themes in interactive technology. Students are able to relate new research results into past research in the field. The exam is based on some research articles, and the objective here is to develop reading skills that are later needed for the Master's thesis.

Content: The course introduces some new interaction techniques, technologies, and environments. The topics of the lectures include gaze-based interaction, ubiquitous computing, tangible user interfaces, and large and small displays. In addition, a fifth topical theme may be included.

Modes of study: Revision test + will be announced later.

Further information on modes of studies: Participation in the classes and course assignments (neither is compulsory but both are recommended).

An exam is always required. In addition, there may be some required assignments, to be specified yearly.

Persons in charge: Professor Kari-Jouko Räihä

Teaching methods: Lectures 24 h. Participation in lectures is not compulsory but it is

recommended. It also may give bonus points in the grading.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces.

Study materials / literature: Slides, selected journal articles and conference papers.

Website: <http://www.cs.uta.fi/nit/>

VTEKS213 Haptic User Interfaces 5–8 ECTS

Objectives: The course gives a comprehensive overview in the research on haptics. After this course the student knows of potentials of the haptic modality and how it can be applied in both unimodal and multimodal contexts.

Content: The course is an introduction to haptic user interface technology and haptic research in general. The topics of the course contain an introduction to human sense of touch, relation of touch, vision and hearing, haptics as a communication modality, haptic technologies, haptics in human-computer interaction, and haptic interfaces for the visually impaired. The course is based on the latest research on multimodal interfaces involving haptics.

Modes of study: Written exam + essay.

Further information on modes of studies: Exam, assignments, and a paper or documented project work.

Persons in charge: Professor Roope Raisamo, researcher Jukka Raisamo.

Teaching methods: Lectures 14 h and tutorials 12 h. Lectures, assignments and guidance.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces.

Time: Period I

Study materials / literature: Will be announced later.

Website: <http://www.cs.uta.fi/hui/>

VTEKS114 Implementation of new interaction techniques 10 ECTS

Objectives: The aim of the course is to get familiar with implementation of advanced user interfaces that make use of new interaction techniques.

Content: The modalities studied in the course include use of eyes, speech, haptics and

computer vision. Each student or student pair designs and implements an application (approved by the teachers) which makes of at least one new interaction modality addressed in the course.

Modes of study: Exercise(s) + seminar.

Persons in charge: Professor of user interface software development.

Teaching methods: Lectures 24 h and seminar 3 h.

Previous studies: Recommended: TKO-PA208 Programming Technique, VTEKS105 New Interaction Techniques.

Time: Periods III, IV

Website: <http://www.cs.uta.fi/init>

VTEKS106 Research Project in Human-Computer Interaction 2–8 ECTS

Objectives: After the course a student can better manage implementation oriented sub-projects in the HCI research context and focus on problems that are crucial regarding the research questions under investigation.

Content: Writing a plan, carrying out original research, writing a report.

Modes of study: Project / practical work + agreement with teacher.

Further information on modes of studies: The details are agreed upon with each student individually.

Evaluation: Pass/fail. Quality of the plan, success in implementing the plan, quality of the report are evaluated.

Persons in charge: Coordinator Poika Iso-koski.

Teaching methods: The work to do for the course depends on the student's project. The schedule, amount of work, and forms of work are agreed upon in the beginning with each student individually.

Previous studies: Compulsory: VTEKS107 Scientific Writing in Human-Computer Interaction, TKOPA13 Introduction to Research Methods. Or similar courses in other universities.

Available only for: major subject students and graduate students

Time: Periods I, II, III, IV

Website: <http://www.cs.uta.fi/rphci/>

VTEKS116 Book exam in Interactive Technology 4–12 ECTS

Objectives: To get profound understanding of a specific topic in Interactive Technology.

Content: Agreed with the examiner. Possible books are given on the web page of the book exam.

Modes of study: General written exam OR Essay.

Further information on modes of studies: Agreed with the examiner.

Persons in charge: Professors Kari-Jouko Rähkä, Roope Raisamo and Veikko Surakka.

Teaching methods: Typically one exam is based on one book. It is possible to take several exams and read several books, and thereby increase the credit total up to the maximum of 12 credit points.

Website: <http://www.cs.uta.fi/vtkirja/>

TKOPS116 Software Architectures 6 ECTS

Objectives: The course familiarises students with software architectures and their use. Object oriented software architectures and their implementations are presented in detail. Special emphasis is given to the reuse of design and implementation solutions, their modularity and flexibility.

Content: Software architectures, object oriented joining mechanisms, layered architectures, software components, design patterns, frameworks and distributed objects.

Modes of study: In Finnish: Exercise(s) + participation in classroom work.

Further information on modes of studies: Project work and active participation in exercises.

Teaching methods: Lectures 42 h and exercises 18 h. 42 h of lectures, exercises, instruction for project work.

Previous studies: Compulsory: TKOPA11 Software Engineering/Ohjelmistotuotanto, TKOPS119 Principles of Object-Oriented Programming Languages.

Study materials / literature: 1. Koskimies, Oliokirja. Satku - Kauppakaari 2000.

Website: <http://www.cs.uta.fi/ohar/>

TKOPS122 Software Agent Technology 6 ECTS

Objectives: The goal of the course is to introduce the participants to principles of software agents. After taking this course the student is familiar with the possibilities of agent technology, solutions for implementation, and can evaluate the suitability of agent technology in a given design problem.

Content: The course is an introduction to software agent technology. The topics contain software agents (different definitions, architectures, and agent programming languages), agent-to-agent communication, platforms for software agents, ontologies, and applications of software agents.

Modes of study: Essay (independent study).

Further information on modes of studies: Weekly tasks and a paper.

Persons in charge: Professor Roope Raisamo.

Teaching methods: Lectures 26 h. Guidance for paper writing.

Previous studies: Recommended: VTE-KA15 Introduction to User Interfaces.

Study materials / literature: 1. Lecture notes, selected journal articles and conference papers.

Further information: A student who already has credits from the course Software Agents cannot get credits from this course.

Website: <http://www.cs.uta.fi/sat/>

TKOPS124 Artificial Intelligence Programming 6–10 ECTS

Objectives: The goal of this course is to provide an overview of various subfields of artificial intelligence through different programming techniques that are used in these fields. Artificial Intelligence programming techniques are demonstrated through the logic programming language Prolog which is a prerequisite for this course.

Content: Definitions and applications of artificial intelligence and various programming techniques utilized in its subfields. Classification of Prolog-programming methods. Applications of these methods in central subfields of artificial intelligence. These subfields include problem solving, heuristic search, planning,

knowledge representation, expert systems, natural language processing, machine learning and non-standard logics.

Modes of study: In Finnish: Weekly Exercises + essay + exercise(s).

Further information on modes of studies: Certain amount of the weekly exercises and an essay (6 ECTS/3 cu). If students wish to be awarded 10 ECTS/5 cu for the course, they must carry out a programming assignment in addition to other requirements.

Persons in charge: Lecturer.

Teaching methods: Lectures 40 h and tutorials 16 h. 40 h of lectures, 16 h of exercises and instruction for project work.

Previous studies: Compulsory: TKOPS114 Logic Programming.

Study materials / literature: Lecture notes.

1. Sterling, L. Shapiro, S., The Art of Prolog - Advanced Programming Techniques. The MIT Press 1994

2. Poole, P., Mackworth, A., Goebel, R., Computational Intelligence: a logical approach. Oxford University Press 1998

3. Bratko, I., PROLOG Programming for Artificial Intelligence. Addison-Wesley 2000.

Website: <http://www.cs.uta.fi/aiome/>

TKOPS115 Neurocomputing 8 ECTS

Objectives: The course introduces the basic methods of neurocomputing and their applications in different problems.

Content: Methods of neurocomputing and algorithms in conjunction with networks with forward and backward input are examined. Topics include also the supervised and unsupervised learning of neural networks. The examined methods are discussed in the context of application examples such as making various inferences.

Modes of study: In Finnish: Written exam + weekly exercises.

Further information on modes of studies: Written examination and active participation in exercises.

Teaching methods: Lectures 36 h and exercises 18 h.

Previous studies: Compulsory: TKOPA215 Data Structures. Basic studies in Mathematics.

Study materials / literature: Simon Haykin, Neural Networks: A Comprehensive Foundation, 2. edition, Prentice Hall, 1999.

Website: <http://www.cs.uta.fi/neuro/>

TKOPS128 Computer Graphics 10 ECTS

Objectives: The main methods and theories of computer graphics are introduced. The aim is to gain a profound understanding of the basics of computer graphics.

Content: The course is mainly based on modern 3D picture processing. Representation, modelling and rendering of 3D objects, image spaces, shading, modelling of the interplay of light and object, mapping techniques such as textures, shadow algorithms, global illumination, anti-aliasing, colours and computer animation are also described.

Modes of study: In Finnish: Written exam + exercise(s).

Teaching methods: Lectures 48 h and exercises 20 h. The course may be taught also in English.

Previous studies: Compulsory: TKOPA215 Data Structures. Basic studies in Mathematics recommended.

Study materials / literature: 1. Foley, van Dam, Feiner, Hughes, Computer Graphics: Principles and Practice. Addison-Wesley 1990

2. Watt, A., 3D Computer Graphics. 2000.

Website: <http://www.cs.uta.fi/tkgraf/>

VTEKS400 Seminar (in Interactive Technology) 2–10 ECTS

Objectives: Command of the special questions examined in the seminar. To practice presentation skills and scientific discussion.

Content: The course deals with special questions concerning a specific field in interactive technology. The topics for the seminars are announced every semester on the notice board of the department and on the homepage of the department.

Modes of study: Seminar.

Further information on modes of studies: Active participation in seminars.

Persons in charge: Professor

Teaching methods: Seminar 28 h. 16-28 h of working in seminars, the number of credits

and requirements are announced at the beginning of each seminar.

Study materials / literature: Announced at the beginning of each seminar.

Website: <http://www.cs.uta.fi/>

1.2 Optional advanced courses in computer science or interactive technology 16 ECTS

16 of the following

Content: These can be selected from the previous list 1.1 and from the advanced courses of other master's degree programmes in computer science or interactive technology.

1.3 Master's Thesis with a topic related to a field of this M.Sc. programme. 40 ECTS

VTEKS901 Master's Thesis (Interactive Technology) 40 ECTS

Objectives: The student composes independently a thesis on a topic related to the field of the Master's programme and demonstrates his/her familiarity with the topic of the thesis, command of the required research methods and ability to write scientific texts.

Content: Independent research on a subject that needs to be agreed upon with the professor of interactive technology or with another instructor.

Modes of study: Written exam + thesis / dissertation. Completion in other languages: In Finnish: Written exam + thesis / dissertation.

Further information on modes of studies: Master's thesis and maturity exam.

Teaching methods: Personal tutoring upon agreement.

Website: <http://www.cs.uta.fi/english/studies/>

2. Other studies in M.Sc. programme 40 ECTS

Please see below.

M.Sc. Programme in Interactive Technology

Objectives: The programme aims at training all-round IT professionals who have a people-friendly approach to their work. In the programme students familiarise themselves with the field on the basis of multidisciplinary teaching. The students can choose their area of specialisation from the various possibilities offered.

Content: An important theme in Information Technology is the improvement of interaction between the human being and technology. The most important topics for research at the University of Tampere are usability evaluation, new interaction techniques, graphic user interfaces, emotional and social user interfaces, information acquisition and presentation, and learning and collaboration technology. Teaching in Interactive Technology in these fields initiates the students into the qualities of human and computation environments. The Master's programme in User Interface Software Development also provides courses in the interaction between the human being and the computer, and it is possible to concentrate on the implementation of new ways of interaction in particular.

Interactive Technology examines the development of interactive-information technical systems that are designed for the use of humans and the phenomena connected with these systems. The subject provides basic knowledge of the whole extensive area, but specialisation and orientation in certain tasks also requires suitable minor subject studies to support the studies in the major subject. Recommended minor subjects include, for example, Computer Science, Psychology, Social Psychology, Sociology, Education, Statistics, Linguistics, Hypermedia and Information Studies.

Prerequisites: Requirements for the lower academic degree

If a student does not meet these requirements, the equivalent studies must be taken as complementing studies.

0.1 A lower academic or a corresponding degree in a suitable field

Students who have taken a B.Sc. degree at the University of Tampere with Computer Science or Interactive Technology as their major subject automatically have the right to take this programme. Students who have some other Bachelor's degree can be accepted into the programme through special-case selection.

0.2 Previous studies must include, or students must extend them to include as part of block 2 "Other studies in M.Sc. programme":

- TKOPA12 Project Work
- VTEKA15 Introduction to User Interfaces
- VTEKA206 Usability Evaluation Methods
- VTEKA203 Human Factors in Interactive Technology

Further information: [International degree students are to take Orientation course 1 ECTS, Guided planning of studies 2 ECTS, Finnish language studies and Intercultural Communication studies, minimum 6 ECTS and English language courses 6 ECTS as part of their programme studies.]

1 Advanced courses in M.Sc. programme in Interactive Technology 80 ECTS

Objectives: Advanced courses in Interactive Technology aim at giving the student versatile skills and a human-centered attitude. The student should get deep knowledge in some field or topics within Interactive Technology, and basic skills in carrying out and reporting research in the field.

Content: The advanced studies should be discussed beforehand with the professor. Advanced studies consist of three parts:

1.1 Compulsory advanced courses 30 ECTS in interactive technology. Courses are to be selected from the following core courses in interactive technology:

- VTEKS101 Groupware, 3-6 ECTS (available in English)
- VTEKS111 Human Information-Processing and Interactive Technology, 5 ECTS (available in English)
- VTEKS115 Introduction to Information Visualization, 3 ECTS (available in English)
- VTEKS112 Information Visualization Project Work, 5 ECTS (available in English)
- VTEKS117 Introduction to experimental research in Interactive Technology, 6 ECTS (available in English)
- VTEKS105 New Interaction Techniques, 5 ECTS (available in English)
- VTEKS106 Research Project in Human-Computer Interaction, 2-8 ECTS (available in English)
- VTEKS107 Scientific Writing in Human-Computer Interaction, 5 ECTS (available in English)
- VTEKS108 Selected Topics in Human-Computer Interaction, 2-6 ECTS (available in English)
- VTEKS301 Design and Development of Speech Interfaces, 8 ECTS (available in English)
- VTEKS104 Emotions and Sociality in Interactive Technology, 6 ECTS (available in English)
- VTEKS114 Implementation of New Interaction Techniques, 10 ECTS (available in English)
- VTEKS213 Haptic User Interfaces, 5-8 ECTS (available in English)
- VTEKS116 Book exam in Interactive Technology, 4-12 ECTS (available in English)
- VTEKS402 Thesis seminar in Interactive technology, 4 ECTS
- VTEKS400 Seminar (with suitable topic)

1.2 Optional advanced courses in interactive technology 10 ECTS.

These courses can be selected from the previous list 1.1 and from the advanced courses of interactive technology and of other master's degree programmes which support interactive technology.

1.3 Master's Thesis 40 ECTS with a topic related to a field of this M.Sc. programme

1.1 Compulsory advanced courses in interactive technology 30 ECTS

VTEKS101 Groupware 3–6 ECTS

Objectives: After the course, the student knows about the challenges in providing technology support for groups, teams, online communities and networks of people. The student will study special topics of the field in a small group using modern groupware applications. In addition to the central concepts of the field introduced in research literature, the student will gain a practical understanding of the usability of current groupware applications in certain group situations. The student learns different approaches in the evaluation of groupware, and can discuss their drawbacks and benefits in real world situations.

Content: Definitions of groups and groupware. Examples of synchronous and asynchronous groupware and social computing for computer mediated communication, computer conferencing and group meetings. Re-

commender systems, social networking and user interface design for social navigation and awareness. Supporting groups in ubiquitous environments. Tools for group work, for instance group writing and drawing. Usability of groupware. Privacy issues.

Modes of study: Written exam + project / practical work + participation in classroom work.

Further information on modes of studies: Active participation in lectures, and open book examination. Participation in group work project and group presentations.

Persons in charge: Lecturer Salla Ovaska.

Teaching methods: Lectures 20 h and seminar 10 h. Lectures, face-to-face and electronic meetings in small groups, collecting and comparing experiences in using groupware in small groups, group essay and group presentations.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces, TKOPA13 Introduction to Research Methods.

Time: Periods III, IV

Study materials / literature: 1. Research papers on CSCW and Groupware (will be specified yearly).

2. Baecker, Readings in Groupware and Computer-Supported Cooperative Work. Morgan Kaufmann 1993.

Website: <http://www.cs.uta.fi/gw/>

VTEKS111 Human Information-Processing and Interactive Technology 6 ECTS

Objectives: The course aims to give students a basis for designing user interfaces that take inherent human capabilities into account and to enable students to take these topics into account when evaluating interfaces. As a result, students will also be prepared to compare human and machine perception and processing as related to new interface techniques.

Content: The course focuses on the basics of human cognitive functioning. Topics include visual and auditory information processing, memory processes, and basic mechanisms related to thinking and problem solving. The emphasis will be on the applicability of the covered topics to interactive technology.

Modes of study: Written exam.

Further information on modes of studies: Exam that covers the lecture notes (in English) and the literature.

Persons in charge: Researcher Toni Vanhala.

Teaching methods: Lectures 20 h.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces, VTEKA203 Human Factors in Interactive Technology, VTEKP2 Introduction to Interactive Technology.

Time: Period I

Study materials / literature: Lecture notes and scientific articles that will be announced later on the WWW-pages of the course.

Further information: This course can be used only for studies in Interactive Technology.

Website: <http://www.cs.uta.fi/hipit/>

VTEKS115 Introduction to Information Visualization 3 ECTS

Objectives: After this course, the students will have an overview of the field of information visualization and its place in the general context of human-computer interaction and related fields. The students will be familiar with the central theories of information visualization, the historical developments in the field and the seminal research.

Content: The course introduces selected topics in information visualization. The topics include, but are not limited to, the following: models and theories of information visualization, visualization techniques, interaction in information visualization, and human factors in information visualization.

Modes of study: Exercise(s) + study journal / learning diary.

Further information on modes of studies: Active participation in the lectures and assignments.

Persons in charge: Researcher Harri Siirtola

Teaching methods: Lectures 24 h.

Previous studies: Compulsory: TKOPA13 Introduction to Research Methods. Or equivalent skills.

Study materials / literature: 1. In addition to selected research articles.

2. Ware, C., Information Visualization: Perception for Design. Morgan Kaufmann 2004

3. Spence, R., Information Visualization: Design for Interaction, 2nd edition. Prentice Hall 2007.

Further information: This course was previously a part of the course Information Visualization (Tiedon visualisointi). This course cannot be taken by students who have taken the previous course.

Website: <http://www.cs.uta.fi/invisu/>

VTEKS112 Information Visualization Project Work 5 ECTS

Objectives: After this course, the student will be familiar with the state-of-the-art information visualization design methodology, and has the necessary skills to design, implement and evaluate information visualization applications. The student will also be familiar with

current visualization application development and prototyping frameworks.

Content: The course consists of lectures and a project work. The main focus is on carrying out the information visualization design project. The project work is carried out in small groups

and the results are presented in a seminar to the whole class.

Modes of study: Project / practical work + participation in classroom work + seminar.

Further information on modes of studies: Active participation in the lectures, project work and presentation of the project work.

Persons in charge: Researcher Tomi Heimonen.

Teaching methods: Lectures 10 h and seminar 4 h.

Previous studies: Recommended: TKOPA223 Principles of Programming Graphical User Interfaces. Compulsory: VTEKS115 Introduction to Information Visualization, TILTP1 Introduction to Statistics. Or equivalent skills.

Study materials / literature: 1. Spence, R., Information Visualization: Design for Interaction, 2nd edition. Prentice Hall 2007.

2. Selected research articles related to the themes of the course.

Further information: Previously partially included in the course Information Visualization (Tiedon visualisointi). This course cannot be taken by students who have taken the previous course.

Website: <http://www.cs.uta.fi/ivpro/>

VTEKS117 Introduction to experimental research in Interactive Technology 6 ECTS

Objectives: After taking the course a student knows the most common experiment designs, the associated statistical methods, and can plan and report simple experiments.

Content: Theoretical foundations of experimental research, operationalization of research questions, choice of experiment design and its connections to the analysis and conclusions, the most common statistical methods, and exercises.

Modes of study: Midterm Examination + weekly exercises + participation in classroom work.

Further information on modes of studies: The teaching is based on the discussions that take place during the lecture and exercise meetings. These meetings discuss literature that is to be read and exercises that are to be done before the meeting. Being present in the meetings is necessary.

Evaluation: 1-5. Grading is based on quizzes on the literature, and on the percentage of exercises that were correctly completed.

Persons in charge: Coordinator Poika Isokoski.

Teaching methods: Lectures 18 h and exercises 18 h.

Previous studies: Compulsory: TKOPA13 Introduction to Research Methods.

Available only for: major subject students and graduate students

Time: Period III

VTEKS105 New Interaction

Techniques 5 ECTS

Objectives: After this course the student has an overview of some active research themes in interactive technology. Students are able to relate new research results into past research in the field. The exam is based on some research articles, and the objective here is to develop reading skills that are later needed for the Master's thesis.

Content: The course introduces some new interaction techniques, technologies, and environments. The topics of the lectures include gaze-based interaction, ubiquitous computing, tangible user interfaces, and large and small displays. In addition, a fifth topical theme may be included.

Modes of study: Revision test + will be announced later.

Further information on modes of studies: Participation in the classes and course assignments (neither is compulsory but both are recommended).

An exam is always required. In addition, there may be some required assignments, to be specified yearly.

Persons in charge: Professor Kari-Jouko Rähä

Teaching methods: Lectures 24 h. Participation in lectures is not compulsory but it is recommended. It also may give bonus points in the grading.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces.

Study materials / literature: Slides, selected journal articles and conference papers.

Website: <http://www.cs.uta.fi/nit/>

VTEKS106 Research Project in Human-Computer Interaction 2–8 ECTS

Objectives: After the course a student can better manage implementation oriented sub-projects in the HCI research context and focus on problems that are crucial regarding the research questions under investigation.

Content: Writing a plan, carrying out original research, writing a report.

Modes of study: Project / practical work + agreement with teacher.

Further information on modes of studies: The details are agreed upon with each student individually.

Evaluation: Pass/fail. Quality of the plan, success in implementing the plan, quality of the report are evaluated.

Persons in charge: Coordinator Poika Iso-koski.

Teaching methods: The work to do for the course depends on the student's project. The schedule, amount of work, and forms of work are agreed upon in the beginning with each student individually.

Previous studies: Compulsory: VTEKS107 Scientific Writing in Human-Computer Interaction, TKOPA13 Introduction to Research Methods. Or similar courses in other universities.

Available only for: major subject students and graduate students

Time: Periods I, II, III, IV

Website: <http://www.cs.uta.fi/rphci/>

VTEKS107 Scientific Writing in Human-Computer Interaction 5 ECTS

Objectives: To learn how to write a scientific paper in Computer Sciences, especially in Human-Computer Interaction (HCI). The

emphasis is on reporting research, not in the actual research.

Content: The publication process and forums. Using and citing literature. Structuring a research paper. Typical mistakes by non-native authors. Writing style. Details of presentation. Reviewing and revising papers.

Modes of study: Essay + participation in online teaching.

Further information on modes of studies: Writing of a research paper, peer reviewing of other papers, and revision of the research paper on the basis of comments received. Participation in classes is not required, but active participation gives bonus points.

Evaluation: 1-5. Primarily the quality of the final version of the paper. In addition, quality of reviews and activity in revising the paper based on comments received.

Persons in charge: Professor Kari-Jouko Räihä

Teaching methods: Lectures 12 h and independent work. 12 hours of introductory lectures, web based tutoring, and two full-day workshops. Each student writes a scientific paper in predefined format. Individual tutoring and feedback is given on developing versions of the paper by the teacher and by other students. Reviews and paper versions are handled in Moodle, so it is possible to take the course remotely. The working language of the course is English.

Previous studies: Recommended: TKOPA13 Introduction to Research Methods. Basic studies in the major (interactive technology or computer science) and some intermediate studies. At least one of the courses given in English by the Language Centre.

Time: Periods I, II

Study materials / literature: 1. Slides and examples from student papers made available over the net.

2. American Psychological Association, Publication Manual of the American Psychological Association. American Psychological Association 2001.

3. Zobel, J., Writing for Computer Science: The Art of Effective Communication (Second edition). Springer 2004.

Website: <http://www.cs.uta.fi/writing/>

VTEKS108 Selected Topics in Human-Computer Interaction 2–6 ECTS

Objectives: To learn the state-of-the-art in selected subfields of human-computer interaction not currently covered in other courses.

Content: Specific topics in human-computer interaction, to be announced on a case-by-case basis.

Modes of study: Study journal / learning diary + participation in classroom work.

Further information on modes of studies: Active participation in the lectures and writing a lecture diary.

Persons in charge: Professor Kari-Jouko Rähä

Teaching methods: Lectures 30 h.

Previous studies: It is recommended that intermediate studies in Interactive Technology are taken before this course.

Study materials / literature: Varies yearly.

Website: <http://www.cs.uta.fi/sthci/>

VTEKS301 Design and Development of Speech Interfaces 8 ECTS

Objectives: To learn the characteristics of human speech and communication, the processing of speech by computers, and the successful use of speech in human-computer interaction to construct working speech applications.

Content: Human factors in speech technology. The nature of sound and language. Speech recognition and synthesis. Speech and non-speech audio. Dialogue management. Prompt design. Error management. Data collection and evaluation methods. Interfaces for speech technology components, description languages and formalisms, speech application architectures, tools and development tools. Implementation and evaluation of speech applications.

Modes of study: Project / practical work.

Further information on modes of studies: Assignments and a documented project work.

Persons in charge: Docent Markku Turunen

Teaching methods: Lectures web-based 40 h. On-line material and assignments. No obligatory meetings, suitable for distant learning.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces.

Study materials / literature: 1. McTear, M., Spoken Dialogue Technology: Towards the Conversational User Interface. Springer 2004.

Further information: The course includes courses "Speech User Interface Project Work" and "Speech Interface Design". You cannot get credits if you have completed these courses. See course homepage for more details.

Website: <http://www.cs.uta.fi/ddsi/>

VTEKS104 Emotions and Sociality in Interactive Technology 6 ECTS

Objectives: The goal of the course is to give students a deep understanding of the basis of human communication and the meaning of emotions both for individuals and the interaction between individuals. The course introduces visions on how human-technology interaction could be developed in the future.

Content: The course consists of a series of lectures and discussions about nonverbal communication, the neural and biological basis of communication and emotions, interconnections between emotions and cognition and motivation, and human-computer interaction.

Modes of study: Written exam.

Further information on modes of studies: Written examination on lectures and literature. Foreign student can take this course by literature examination. The literature will be informed separately for students who have registered themselves in time to the course.

Persons in charge: Professor Veikko Surakka

Teaching methods: Lectures 24 h. + independent work

Previous studies: Compulsory: VTEKA203 Human Factors in Interactive Technology, VTEKS111 Human Information-Processing and Interactive Technology.

Study materials / literature: Articles: 1. LeDoux, J.E. (2000) Emotion circuits in the brain. *Annu. Rev. Neurosci.* 23:155-184. 2. Christine Lisetti, Cynthia LeRouge (2004) Affective Computing in Telehome Health. Proceedings of the 37th Hawaii International Conference on System Sciences - 2004, 1-8. 3. Rizzolatti, G., and Arbib, A. A. (1998). Language

within our grasp, Trends in Neuroscience, 21, 188-194. 4. Schaal, S (1999). Is imitation learning the route to humanoid robots? Trends in Cognitive Sciences 3:233-242. 5. Surakka, V. (1996) Kasvonilmeet ja emootioiden tutkimus. Psykologia, 31, 412-420. 5. Surakka, V. (2004) Tunteet ja sosiaalisuus ihmisen-tietokone vuorovaikutuksessa, 39, 19-28. Cassell - Sullivan - Prevost - Churchill, Embodied Conversational Agents. The MIT Press 2000.

Further information: Previous name: Human Communication, Emotions, and Computation

Website: <http://www.cs.uta.fi/ivp/>

VTEKS114 Implementation of new interaction techniques 10 ECTS

Objectives: The aim of the course is to get familiar with implementation of advanced user interfaces that make use of new interaction techniques.

Content: The modalities studied in the course include use of eyes, speech, haptics and computer vision. Each student or student pair designs and implements an application (approved by the teachers) which makes of at least one new interaction modality addressed in the course.

Modes of study: Exercise(s) + seminar.

Persons in charge: Professor of user interface software development.

Teaching methods: Lectures 24 h and seminar 3 h.

Previous studies: Recommended: TKO-PA208 Programming Technique, VTEKS105 New Interaction Techniques.

Time: Periods III, IV

Website: <http://www.cs.uta.fi/init>

VTEKS213 Haptic User Interfaces 5–8 ECTS

Objectives: The course gives a comprehensive overview in the research on haptics. After this course the student knows of potentials of the haptic modality and how it can be applied in both unimodal and multimodal contexts.

Content: The course is an introduction to haptic user interface technology and haptic research in general. The topics of the course contain an introduction to human sense of touch, relation of touch, vision and hearing,

haptics as a communication modality, haptic technologies, haptics in human-computer interaction, and haptic interfaces for the visually impaired. The course is based on the latest research on multimodal interfaces involving haptics.

Modes of study: Written exam + essay.

Further information on modes of studies: Exam, assignments, and a paper or documented project work.

Persons in charge: Professor Roope Raisamo, researcher Jukka Raisamo.

Teaching methods: Lectures 14 h and tutorials 12 h. Lectures, assignments and guidance.

Previous studies: Compulsory: VTEKA15 Introduction to User Interfaces.

Time: Period I

Study materials / literature: Will be announced later.

Website: <http://www.cs.uta.fi/hui/>

VTEKS116 Book exam in Interactive Technology 4–12 ECTS

Objectives: To get profound understanding of a specific topic in Interactive Technology.

Content: Agreed with the examiner. Possible books are given on the web page of the book exam.

Modes of study: General written exam OR Essay.

Further information on modes of studies: Agreed with the examiner.

Persons in charge: Professors Kari-Jouko Räihä, Roope Raisamo and Veikko Surakka.

Teaching methods: Typically one exam is based on one book. It is possible to take several exams and read several books, and thereby increase the credit total up to the maximum of 12 credit points.

Website: <http://www.cs.uta.fi/vtkirja/>

VTEKS402 Thesis seminar in Interactive technology 4 ECTS

Modes of study: In Finnish: Seminar.

Teaching methods: Tutorials 30 h.

VTEKS400 Seminar (in Interactive Technology) 2–10 ECTS

Objectives: Command of the special questions examined in the seminar. To practice presentation skills and scientific discussion.

Content: The course deals with special questions concerning a specific field in interactive technology. The topics for the seminars are announced every semester on the notice board of the department and on the homepage of the department.

Modes of study: Seminar.

Further information on modes of studies: Active participation in seminars.

Persons in charge: Professor

Teaching methods: Seminar 28 h. 16-28 h of working in seminars, the number of credits and requirements are announced at the beginning of each seminar.

Study materials / literature: Announced at the beginning of each seminar.

Website: <http://www.cs.uta.fi/>

1.2 Optional advanced courses in interactive technology 10 ECTS

10 of the following

Content: These courses can be selected from the previous list 1.1 and from the advanced courses of interactive technology and of other master's degree programmes which support interactive technology.

1.3 Master's Thesis with a topic related to a field of this M.Sc. programme 40 ECTS

VTEKS901 Master's Thesis (Interactive Technology) 40 ECTS

Objectives: The student composes independently a thesis on a topic related to the field of the Master's programme and demonstrates his/her familiarity with the topic of the thesis, command of the required research methods and ability to write scientific texts.

Content: Independent research on a subject that needs to be agreed upon with the professor of interactive technology or with another instructor.

Modes of studies: Master's thesis and maturity exam.

Teaching methods: Personal tutoring upon agreement.

Website: <http://www.cs.uta.fi/english/studies/>

2. Other studies in M.Sc. programme 40 ECTS

Please see below.

Complementing studies

If a student is required to complement the studies taken in the existing degree, the following courses may be used as complementing studies (previous studies in 0.2 of the programme requirements).

TKOPA213 Database Programming 8 ECTS

Objectives: The course aims at introducing database programming to students. In the course problems such as how to handle large amounts of data in programmes, how to access data in databases using different data models, and how data is administrated in different databases are dealt with. Upon completion of the course students should be able to create new databases, use the SQL language in administration tasks and use SQL embedded in programmes, which have been created with a general programming language.

Content: The emphasis of the course is on relational data models and their query languages and programming styles. Query optimisation, transaction processing and consistency monitoring are discussed on a general level. In addition to relational data models, other database models are examined. In practical database programming, the focus is on SQL embedded in high level languages and JDBC and OCBC programming interfaces. WWW based database programming is also considered.

Modes of study: In Finnish: Written exam + exercise(s) + project / practical work.

Persons in charge: Assistant professor Marko Junkkari.

Teaching methods: Lectures 32 h and exercises 16 h. And instruction for project work.

Previous studies: Compulsory: TKOPA14 Introduction to Object-Oriented Programming, TKOPA215 Data Structures, TKOPP3 Data Bases. Data Bases or the old course Principles of Information Systems. Data Structures must be taken before this course or simultaneously with it.

Study materials / literature: 1. Elmasri, R. & Navathe, S., Fundamentals of Database Systems. Benjamin/Cummings 1997.

Website: <http://www.cs.uta.fi/tiko/>

TKOPA215 Data Structures 10 ECTS

Objectives: The course aims at acquainting students with the principles of data structures, algorithms used with them, and abstract data types to be implemented with them.

Content: Abstract data types, computing performance analysis, recursion, sorting, linear data structures (lists, queues, stacks), trees, binary search trees and heaps, network data structures, graphs (divertex, unweighted, weighted), shortest path algorithms, minimum spanning trees, hashing, strings, regular expressions, finite state automata, and principles of algorithm design.

Modes of study: In Finnish: Written exam + exercise(s) + weekly exercises.

Persons in charge: Professor Martti Juhola.

Teaching methods: Lectures 52 h and exercises 26 h.

Previous studies: Compulsory: TKOPA14 Introduction to Object-Oriented Programming.

Study materials / literature: 1. Goodrich M.T., Tamassia R., Data Structures and Algorithms in Java. John Wiley & Sons 1st ed. 1998 or 2nd ed. 2001

Website: <http://www.cs.uta.fi/tira/>

VTEKA203 Human Factors in Interactive Technology 2 ECTS

Objectives: The aim is to gain an understanding of the basics of human cognitive, emotional, and motivational processes, as well as the basic factors of human-human interaction. During the course, the students will gain a preliminary understanding for utilizing these factors when developing efficient and enjoyable human-computer interaction.

Content: The course consists of lectures and literature focusing on the mechanisms of human perception, attention, memory, non-verbal behaviour, and emotion. Examples of the effects of emotions on cognitive processing in HCI will be given as well.

Modes of study: Participation in classroom work + written exam.

Further information on modes of studies: Closed-book exam that covers both the lectures and the literature. Students can answer either in English or Finnish.

Persons in charge: Professor Veikko Surakka.

Teaching methods: Lectures 12 h. Students must attend the lectures. In case 50% or more of students are foreign ones then the teaching language will be English. Slides are in English.

Previous studies: No prerequisites.

Study materials / literature: Will be announced on a yearly basis on the course homepages.

Further information: This course can be included only in the studies of interactive technology.

Website: <http://www.cs.uta.fi/hfit/>

VTEKA15 Introduction to User Interfaces 5 ECTS

Objectives: The course discusses in detail the guidelines for graphical user interface design. Upon completion of the course the student will be able to design screens, dialogues and on-line help, and also to design and evaluate the interaction in different use contexts. The student knows input and output modalities and their design possibilities and challenges.

Content: User centered design. On-line help. Different interaction styles and techniques (forms and dialogue box designs, direct manipulation, menus, agents, hypertext) with guidelines. New interaction techniques. The challenges of the use context (desktop, mobile, ubi) in design.

Modes of study: Revision test + exercise(s) + weekly exercises.

Persons in charge: Lecturer Saira Ovaska.

Teaching methods: Lectures 24 h, tutorials 2 h and exercises 14 h.

Previous studies: Compulsory: VTEKP2 Introduction to Interactive Technology.

Study materials / literature: Lecture notes and parts of the books:

1. Dix, A., Finlay, J., Abowd, G. & Beale, R., Human-Computer Interaction. Third edition. Pearson Education Ltd. 2004. <http://www.hci-book.com/e3/>
2. Microsoft Windows Vista User Experience Guidelines. <http://msdn2.microsoft.com/en-us/library/aa511258.aspx>
3. Windows XP Official Guidelines for User Interface Developers. Microsoft Press 2001. <http://www.microsoft.com/downloads/details.aspx?FamilyID=B996E1E7-A83A-4CAE-936B-2A9D94B11BC5&displaylang=en>
4. Apple Human Interface Guidelines. <http://developer.apple.com/documentation/UserExperience/Conceptual/OSXHIGuidelines/OSXHIGuidelines.pdf>
5. Preece, J. et al., Human-Computer Interaction. Addison-Wesley 1994.
6. Mullet, K. & Sano, D., Designing Visual Interfaces. Sunsoft 1994.

Website: <http://www.cs.uta.fi/ui-eng/>

TKOPA223 Principles of Programming Graphical User Interfaces 5 ECTS

Objectives: To provide basic knowledge of programming graphical user interfaces in a .NET environment using C# language.

Content: Course topics include event based programming, user interface architectures and basic designs, user interface components and advanced programming environments.

Modes of study: In Finnish: Project / practical work.

Persons in charge: Professor Roope Raimo.

Teaching methods: Lectures 14 h and exercises 12 h. And project work. The project work will be carried out as group work and will involve programming a small graphical application.

Previous studies: Compulsory: TKOPA14 Introduction to Object-Oriented Programming, VTEKA15 Introduction to User Interfaces.

Time: Period III

Study materials / literature: Moodle-materiali: <https://moodle.uta.fi/>

Further information: Some of the topics have previously been included in the course Programming Graphical User Interfaces.

Website: <http://www.cs.uta.fi/~grtot/>

TKOPA208 Programming Technique 6 ECTS

Objectives: Students have the skills (especially with memory management) required to construct a large object oriented programme using the C++ language.

Content: The course introduces pointers, procedures, parameters, basics of memory control, class abstraction, inheritance, file management, dynamic data structures, recursion and some tools to support programming.

Modes of study: In Finnish: Written exam + weekly exercises + exercise(s).

Persons in charge: Assistant professor.

Teaching methods: Lectures 28 h and exercises 16 h.

Previous studies: Compulsory: TKOPA14 Introduction to Object-Oriented Programming, TKOPP1 High Level Programming.

Study materials / literature: 1. Stroustrup, B., The C++ programming language. Docendo Finland Oy 2000;
2. Hietanen, P., C++ ja olio-ohjelmointi. Teknolit 2004.

Website: <http://www.cs.uta.fi/ote/>

TKOPA12 Project Work 6–12 ECTS

Objectives: The goal of the course is to initiate students into the design, implementation and organisation of project work. During the study module, students design and implement a genuine project within the context of an imaginary software company.

Content: The nature of project work. The design, documentation and supervision of a project. Implementation of a genuine project. Usability in a project.

Modes of study: Project / practical work + participation in classroom work.

Further information on modes of studies: Students have to participate actively in the project and write a final report and present it.

Persons in charge: Lecturer Timo Poranen.

Teaching methods: Lectures 16 h.

Previous studies: Recommended: TKOPA208 Programming Technique, VTEKA209 Graphical User Interface Design Project. Compulsory: TKOPA14 Introduction to Object-Oriented Programming, TKOPA11 Software Engineering/Ohjelmistotuotanto. A minimum of 50 ECTS (25 cu) of studies in computer sciences including the basic studies study module P1 in computer sciences, courses TKOPA14 Introduction to Object Oriented Programming and TKOPA11 Software Engineering. In addition TKOPA208 Programming Technique is recommended for students in computer science and course Graphical User Interface Design Project is recommended for students in interactive technology. Minimum amount of previous studies: 50 ECTS

Study materials / literature: 1. Haikala & Märijärvi, Ohjelmistotuotanto. Talentum Media Oy 2004;

2. Pressman, Software Engineering, A Practitioner's Approach. McGraw-Hill Publishing Company 2004.

Website: <http://www.cs.uta.fi/pt/>

VTEKA206 Usability Evaluation Methods 7 ECTS

Objectives: The aim of the course is to develop an understanding of usability evaluation methods and to know when to use them during the product development life cycle both with and without the user. The methods will be first studied theoretically and then applied in practice as weekly assignments and project work. The emphasis of the course is in the hands-on usability evaluation project which is carried out as a team work. The project work involves evaluating and reporting the usability of a given product using good procedures. The project work also gives students team work skills needed in working life. After the course the student knows how to carry out a heuristic evaluation and a usability test in a laboratory, and write a usability test plan and report the findings.

Content: The importance of usability evaluation in different stages of the product life cycle, the influence of different types of user interfaces and user groups in the selection of the methods, ethical considerations in usability studies, heuristic evaluation, usability evaluation

ation in the lab, making a test plan, conducting usability tests, analyzing and reporting, team work skills.

Modes of study: Exercise(s) + participation in classroom work.

Further information on modes of studies: Active participation in class, work on weekly assignments and project work on usability evaluation.

Persons in charge: Researcher Jenni Anttonen.

Teaching methods: Lectures 14 h and exercises 14 h. Also instruction for team work.

Previous studies: Compulsory: VTEKP2 Introduction to Interactive Technology.

Study materials / literature: Defined later on.

Further information: Some of the course topics have previously been included in the course Human Factors in Computing Systems.

Website: <http://www.cs.uta.fi/kame/>

Other studies

The extent of this component of the Master's degree programmes is 40 ECTS. These studies include the General Studies, and Language and Communication Studies, and any courses required as complementing studies (previous studies in 0.2 of the programme requirements), if the complementing studies are taken inside the 120 ECTS of programme studies. If no complementing studies are required, the student has the option of choosing minor subject courses in the Faculty of Information Sciences or other UTA faculties.

General Studies (MSc programmes given in English) 3 ECTS

Students studying in the Master of Science degree programmes given in English are to take the following General Studies courses:

MUUI01 Orientation course 1 ECTS

TKOPY2 Guided planning of studies (including the HOPS plan) 2 ECTS

Language and Communication Studies (MSc programmes given in English) 12 ECTS

English

- English language assesment test

- English language studies 3-6 ECTS (according to the assessment test)

All new Master programme students are tested by the UTA Language Center using the Oxford Quick Placement Test. All programme students are to take Introduction to Thesis Writing 3 ECTS. Another course in English (Oral and Writing Skills 3 ECTS) must be taken if the test result shows them to be necessary.

Finnish

Elementary level Finnish courses 6 ECTS (Elementary 1 and 2 or higher level) OR one of the following:

- Survival course in Finnish 2 ECTS, Follow-up course in Finnish 2 ECTS, and a language course (student's mother tongue and English excluded) 3 ECTS OR

- Survival course in Finnish 2 ECTS, and a language course (student's mother tongue and English excluded) 4 ECTS OR

- Survival course in Finnish 2 ECTS, and Introduction to Intercultural Communication 5 ECTS

This Study Guide shall be in use from 1 August, 2008.