

# Study Guide for Doctoral Studies for the Department of Information Technology

At the Department of Information Technology, postgraduate students can complete the degrees of Doctor of Science in Technology or Doctor of Philosophy in one of the following fields of specialisation:

Field of specialisation:	Professor responsible:
1430 <b>Intelligent Computing</b>	Prof. Heikki Kälviäinen
1650 <b>Communications Software</b>	Prof. Jari Porras
1423 <b>Software Engineering</b>	Prof. Kari Smolander

Each of the above-mentioned fields can be selected as a major subject for postgraduate studies on the condition that the student has fulfilled the prerequisites for the field.

The degree of Master of Science in Technology in Information Technology from LUT or an applicable degree in engineering, mathematical methods, electronics or applied physics from any other university qualifies a student for major studies in intelligent computing, communications software or software engineering. The content of these major and supporting studies is discussed in the following sections.

Planning the postgraduate studies is started by contacting the professor responsible for the major subject, who is in charge of assigning supervisors for the major studies from within the university. The faculty council confirms possible prerequisites and the postgraduate study plan, and appoints a supervisor for the postgraduate studies. The supervisor can be a tenured professor, an adjunct professor, or an acting professor holding a doctorate. The rector accepts the postgraduate student into the university after getting a statement from the faculty council.

The Department of Information Technology is part of the East Finland Graduate School in Computer Science and Engineering (ECSE) to which a post-graduate student can apply to study in specific application periods. In the graduate school, students complete their studies in approximately four years under the supervision of an instructor assigned to them. More information can be found at <http://www.it.lut.fi/opiskelu/ecse>.

Scientific postgraduate studies are composed as follows:

Field of research (major)	35 – 40 cr
Supporting studies	20 – 25 cr
Total	<hr/> 60 credits

Studies in the student's field of research are postgraduate level studies. Studies are completed in the form of courses of the postgraduate school or other applicable courses, courses provided by universities, exams on scientific literature in the field or other scientific study attainments.

Supporting studies should form an acceptable entity that supports the field of research and should be at least Master's level studies.

Postgraduate studies should be planned and agreed on together with the supervising professor. The final degree requirements are accepted in a faculty council meeting before the dissertation process begins. Application forms and instructions on the approval of the degree requirements can be found on the university web site at <http://www.lut.fi/en/technologymanagement/it/studies/postgraduate/Pages/Default.aspx>

The postgraduate study application should always include a preliminary study and research plan with a timetable signed by both the student and the supervisor. The study plan should describe at least the topic area of the research, the background of and current developments in the topic area, and an outline of the student's own research and studies. The plans are presented in public as required by the laboratory before the faculty council meeting. A notice of the presentation should be given at least one week in advance on the department mailing list. The purpose of the presentation and the plans is to give other researchers a chance to evaluate the plans, and to strengthen the commitment of both the student and the supervisor to the studies. The supervisor acts as the moderator in the presentation.

## **Postgraduate studies in the Laboratory of Machine Vision and Pattern Recognition**

The Laboratory of Machine Vision and Pattern Recognition is in charge of the major subject in Intelligent Computing. The research of the laboratory focuses on solving research problems in the field of intelligent information processing. The postgraduate student can specialise for example in:

- various fields in machine vision and pattern recognition, such as digital image processing and content-based image analysis, robot vision and data mining.

Additional information on the research groups of machine vision and pattern recognition can be found at <http://www.lut.fi/en/technologymanagement/it/research/mvpr>.

Courses for postgraduate students:

- CT10AJ100 ECSE International Summer School in Novel Computing.
- CT10AJ300 Research Seminar on Information Technology.
- CT50AJ100 Advanced Topics in Information Processing.
- CT60AJ500 Advanced Topics in Software Engineering.

A course in which the topic changes annually can be included in the studies more than once.

Master's level courses suitable for major studies in Intelligent Computing (and Information Processing):

- CT50A6000 Pattern Recognition.
- CT50A6100 Machine Vision and Digital Image Analysis.
- CT50A6200 Computer and Robot Vision.

Instructions regarding Intelligent Computing also apply to postgraduate students whose major is Information Processing.

## Postgraduate studies in the Laboratory of Software Engineering

The Laboratory of Software Engineering is in charge of the major subject of Software Engineering. Students of Software Engineering will get expertise in software development, its processes, methods and tools. Typical roles for the graduates of this major include software architects, programming experts, software product managers, and systems analysts. Common tasks in the field include

- Design, development, and maintenance of software and information systems
- Software and systems analysis and design
- Participation to software development projects in either supplier or customer role
- Software research and product development
- Management of software development organizations.

Additional information on the research groups of software engineering can be found at <http://www.lut.fi/en/technologymanagement/it/research/swe>.

Courses for postgraduate students:

- CT10AJ100 ECSE International Summer School in Novel Computing.
- CT10AJ300 Research Seminar on Information Technology.
- CT50AJ100 Advanced Topics in Information Processing.
- CT60AJ500 Advanced Topics in Software Engineering.

Master's level courses suitable for major studies in Software Engineering:

- CT10A9700 Summer School on Communications Engineering.
- CT60A7400 Fundamentals of Information Systems.
- CT60A7200 Architecture in Systems and Software Development.
- CT60A7301 Software Quality, Processes, and Organizations.
- CT30A8001 User-Centric Service Design.
- CT30A8901 Service Oriented Communications.

## Postgraduate studies in the Laboratory of Communications Software

The Laboratory of Communications Software is in charge of the major subject of Communications Software. The research of the laboratory focuses on solving problems in the field of information networks and usage of short-range radio technology. An open, collaborative approach and software intensiveness play an important role. Postgraduate students of Communications Software can specialise for example in:

- the protocol of distributed services and applications, architectures, software platforms, information security and awareness of security,
- software solutions that favour security, trust and protection of privacy
- software solutions that enable a user-centric service environment

Additional information on the research groups of Communications Software can be found at <http://www.lut.fi/en/technologymanagement/it/research/comlab/>.

Courses for postgraduate students:

- CT10AJ100 ECSE International Summer School in Novel Computing.
- CT10AJ300 Research Seminar on Information Technology.
- CT30AJ100 Tietoliikennetekniikan jatko-opintokurssi

A course in which the topic changes annually can be included in the studies more than once.

Master's level courses suitable for major studies in Communications Software (and Communications Engineering):

- CT10A9700 Summer School on Communications Engineering.
- CT30A6900 Peer-to-peer Networking.
- CT30A7001 Concurrent and Parallel Computing.
- CT30A8001 User-Centric Service Design.
- CT30A8300 Wireless Service Engineering.
- CT30A8800 Secured Communications.
- CT30A8901 Service Oriented Communications.
- CT60A7400 Fundamentals of Information Systems.
- CT60A7200 Architecture in Systems and Software Development.
- CT60A7301 Software Quality, Processes, and Organizations.

## Postgraduate courses in the Department of Information Technology

Courses are lectured as needed, except CT10AJ100 ECSE International Summer School in Novel Computing, which is lectured annually.

<b>CT10AJ100</b>	<b>ECSE INTERNATIONAL SUMMER SCHOOL IN NOVEL COMPUTING</b>	<b>1 - 2 ECTS cr</b>
<b>Lecturer</b>	<i>Itä-Suomen tietotekniikan tutkijakoulun kesäkoulu</i>	
<b>Aims</b>	<b>Lectured annually</b> Lecturer responsible: Professor, D.Sc. (Tech.) Heikki Kälviäinen A student actively participates in the summer school. A student learns the scientific basics, research activities and application areas of one of the selected topics of the summer school.	
<b>Contents</b>	Content changes every year. Lectures will be held by visiting international lecturers.	
<b>Instructions</b>	Lectures and/or exercises, 40 h, and/or practical assignments.	
<b>Literature</b>	<a href="http://www.it.lut.fi/opiskelu/ecse/courses.html">http://www.it.lut.fi/opiskelu/ecse/courses.html</a>	
<b>CT20AJ100</b>	<b>ADVANCED TOPICS IN INFORMATION PROCESSING</b>	<b>2/7 ECTS cr</b>
<b>Lecturer</b>	<i>Tietojenkäsittelytekniikan jatko-opintokurssi</i>	
<b>Aims</b>	<b>Lectured as needed, period will be announced later.</b> Professor, D.Sc. (Tech.) Heikki Kälviäinen To support Ph.D. studies by introducing recent research issues in information processing for Ph.D. students.	
<b>Contents</b>	The topic changes annually.	
<b>Instructions</b>	Lectures, seminar presentations, discussions, and practical assignments. An oral presentation, a written seminar report, home work, active participation to the course, and an exam (7 ECTS cr). Without an exam and home work 2 ECTS cr.	
<b>Literature</b>	To be announced in the beginning of the lectures. For more information see <a href="http://www.it.lut.fi/opiskelu/ecse/">http://www.it.lut.fi/opiskelu/ecse/</a> .	

<b>CT20AJ300</b>	<b>RESEARCH SEMINAR ON INFORMATION TECHNOLOGY</b>	<b>5 ECTS cr</b>
<b>Lecturer</b>	<i>Tietotekniikan tutkimusseminaari</i> <b>Lectured as needed, period will be announced later.</b> Professor, D.Sc. (Tech.) Heikki Kälviäinen	
<b>Aims</b>	The course contains two basic aims: firstly to present current research topics in information technology, and secondly to get familiar with principles and practices of scientific writing and oral presentation.	
<b>Contents</b>	Topics will be announced at the beginning of the course.	
<b>Instructions</b>	Lectures, seminar presentations, and discussions. An oral presentation and a written seminar report, acting as an opponent to other seminar speakers, home work, and active participation to the seminar.	
<b>Literature</b>	Eva May: Tiedettä englanniksi – Akateemisen kirjoittamisen käsikirja, Jyväskylän yliopistopaino, 1996. Webster's Compact Writers Guide, Merriam-Webster Inc., 1987.	
<b>CT20AJ500</b>	<b>ADVANCED TOPICS IN SOFTWARE ENGINEERING</b>	<b>2/7 ECTS cr</b>
<b>Lecturer</b>	<i>Ohjelmistotekniikan jatko-opintokurssi</i> <b>Lectured as needed, period will be announced later.</b> Professor, Ph.D. Kari Smolander	
<b>Aims</b>	To support Ph.D. studies by introducing recent research issues in software engineering and systems development for Ph.D. students.	
<b>Contents</b>	The topic changes annually.	
<b>Instructions</b>	Lectures, seminar presentations, discussions, and practical assignments. An oral presentation, a written seminar report, home work, active participation to the course, and an exam (7 ECTS cr). Without an exam and home work 2 ECTS cr.	
<b>Literature</b>	To be announced in the beginning of the lectures.	
<b>CT30AJ100</b>	<b>TIETOLIIKENNETEKNIIKAN OPINTOKURSSI</b>	<b>JATKO- 2/7 op</b>
<b>Opettaja</b>	<i>Advanced Topics in Telecommunications 1</i> <b>Lectured as needed, period will be announced later. If interested, please contact prof. Porras.</b> Professori, TKT Jari Porras	
<b>Tavoitteet</b>	Perehdytään tietoliikennetekniikan ajankohtaisiin tutkimusalueisiin.	
<b>Sisältö</b>	Aihe vaihtuu vuosittain.	
<b>Opetus</b>	Luentoja, seminaariesitelmää, keskustelua ja harjoituksia. Aktiivinen osallistuminen, seminaariesitelmä, harjoitukset ja tentti (7 op). Voi myös suorittaa ilman harjoituksia ja tenttiä (2 op).	
<b>Kirjallisuutta</b>	Ilmoitetaan luentojen alkaessa.	