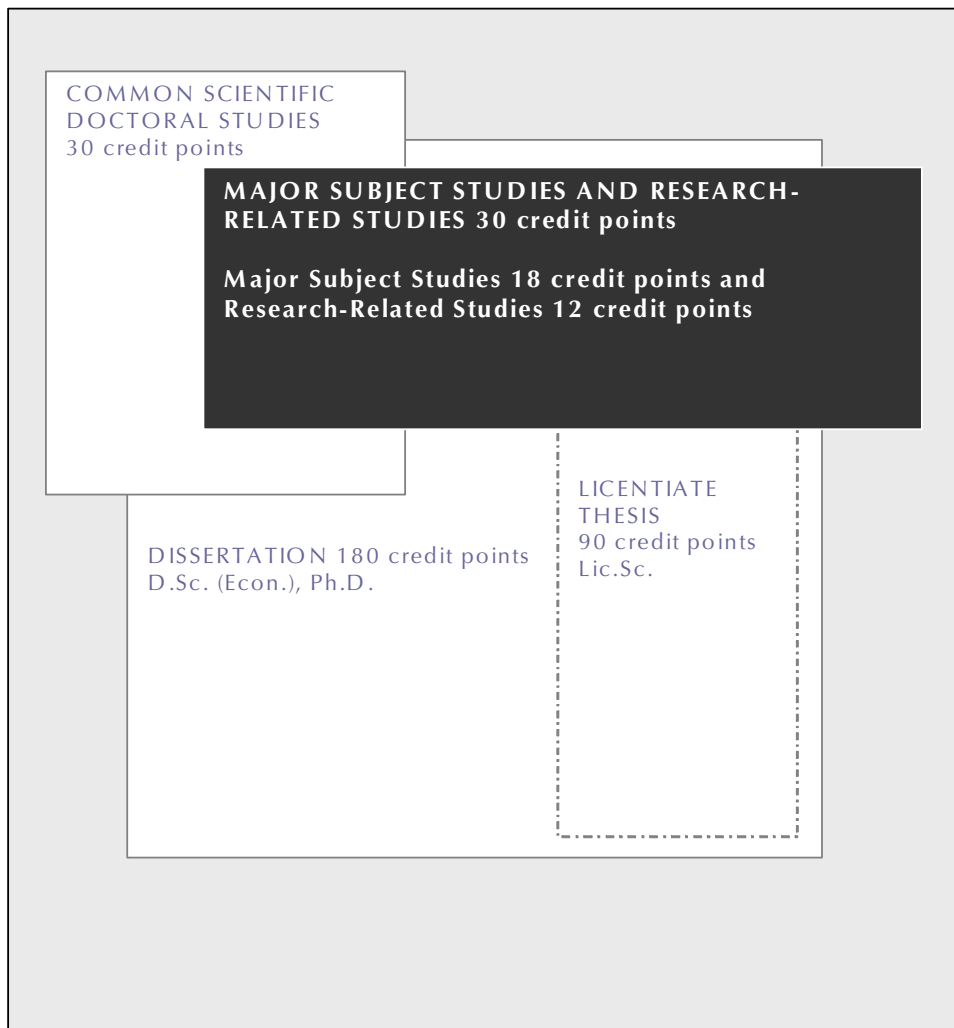


# 9

## DEPARTMENT OF BUSINESS TECHNOLOGY

### (Liiketoiminnan teknologian laitos)

- Management Science • Logistics • Quantitative Methods of Economics and Management Science • Technology Management and Policy
- Information Systems Science



## 9.1 Management Science (Liikkeenjohdon systeemit)

<http://www.hse.fi/systeemit>

Students interested in postgraduate studies in Management Science are encouraged to acquire strong methodological skills already during their undergraduate studies. In addition to the obligatory methodological studies, special courses in mathematics and statistics are recommended.

### **DEGREE REQUIREMENTS AND STRUCTURE**

#### **1. Common Scientific Doctoral Studies, 30 ECTS credits**

See section 5.

#### **2. Major Subject Studies and Research-Related Studies, 30 ECTS credits**

##### **2.1 Major Subject Studies, 18 ECTS credits**

The Major Subject Studies consist of the following studies:

27L200 11 Research Seminar, 0 ECTS credits

The general requirements of the major include also one or other of the following two modules:

a) Optimization Theory, Decision Theory and Stochastic Models, or

b) Negotiation Process Research

These studies must be discussed with the examiner/supervisor.

##### **2.2 Research-Related Studies, 12 ECTS credits**

These must be discussed with the supervisor.

#### **Licentiate degree 150 ECTS credits**

Doctoral students can first produce a licentiate thesis of 90 ECTS credits; a licentiate degree (Lic.Sc.) thus consists of 60 ECTS credits of course work (Common Scientific Doctoral Studies as well as Major Subject Studies and Research-Related Studies and the licentiate thesis.

27L150 00 Licentiate Thesis, 90 ECTS credits

#### **Doctoral Degree, 240 ECTS credits**

Doctoral students can progress directly towards a doctorate (D.Sc. (Econ.) or Ph.D.) The doctorate consists of 60 ECTS credits of course work (Common Scientific Doctoral Studies as well as Major Subject Studies and Research-Related Studies; see points 1 and 2 above) and the Doctoral Dissertation.

27T000 00 Doctoral Dissertation, 180 ECTS credits

Professor **Markku Kallio** is in charge of the doctoral program in Management Science (contact information, see section 2.9).



KARLIN, S., A First Course in Stochastic Processes. 2nd edition, New York 1975.

**Grading:** points (0-100)

**b) 27L304 Negotiation Process Research (18 ECTS credits)**

This module comprises scientific papers on negotiation theory and its applications. The studies must be discussed with the examiner/supervisor and can include book exams, seminars, courses, studies abroad, literature surveys or other documented assignments.

**Postgraduate courses during the 2009-10 academic year:**

<b>27E07000</b>	<b>Investment Science</b>	<b>6 ECTS credits</b>
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**Description:** Mean-variance theory, arbitrage pricing theory, price processes, derivative instrument pricing, options, interest rate derivatives, multiperiod portfolio optimization, real options.

**Literature:** LUENBERGER, D.G. (1998), Investment Science.

**Teaching:** Lectures 42 h, homework assignments. Professor Markku Kallio in the 2010, second term. Final exam (100%)

**Grading:** points (0-100)

**Registration:** Via WebOodi.

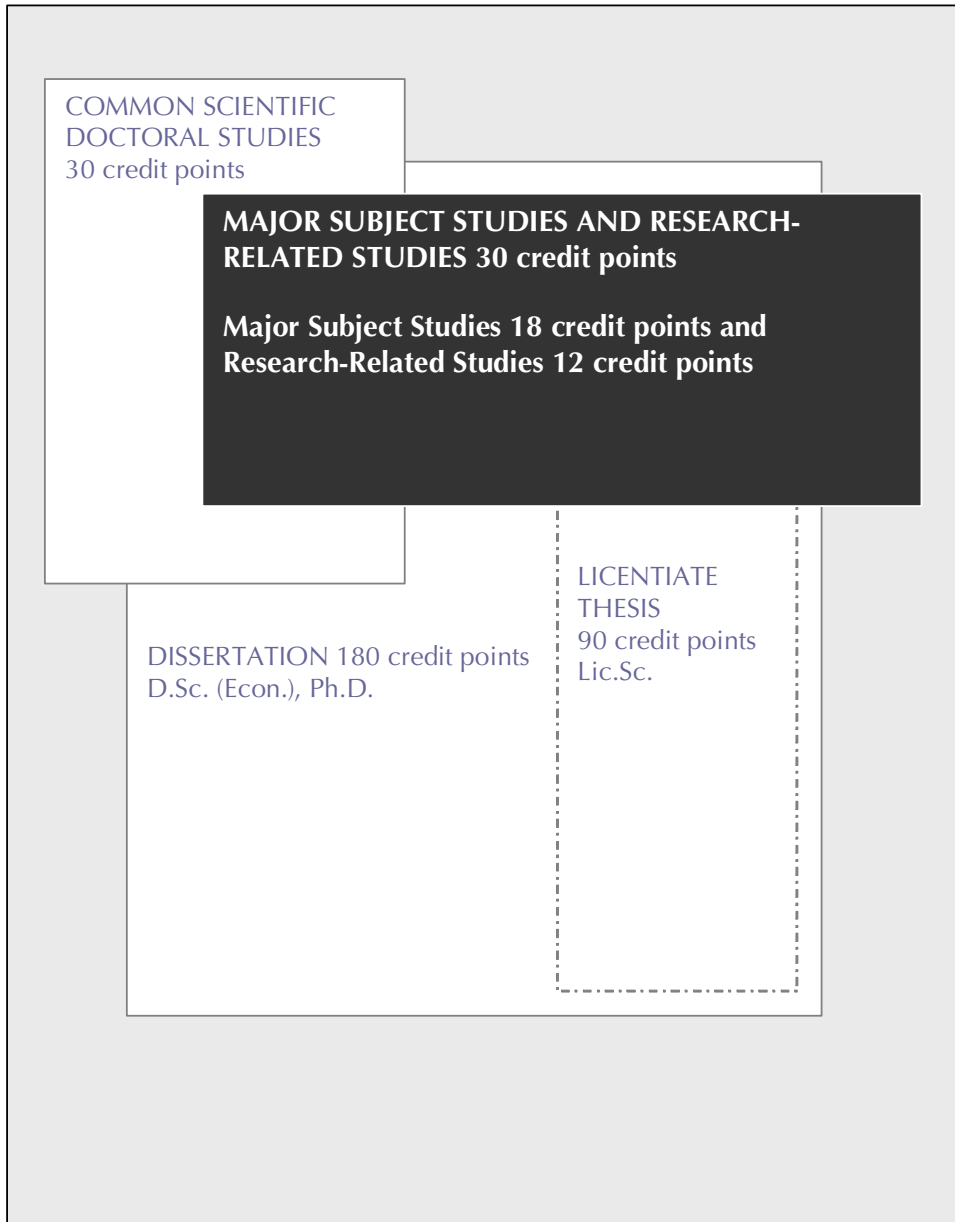
**Course homepage:** <https://cie.hkkk.fi/27e07000>

**RESEARCH-RELATED STUDIES**

To be discussed with the supervisor.

*For more information see the Study Guide in Finnish.*

## 9.2 Logistics (Logistiikka)



## **DEGREE REQUIREMENTS AND STRUCTURE**

### **1. Common Scientific Doctoral Studies, 30 ECTS credits**

See chapter 5.

### **2. Major Subject Studies and Research-Related Studies, 30 ECTS credits**

#### **2.1 Major Subject Studies, 18 ECTS credits**

The Major Subject Studies comprise:

35L200 11 Research Seminar 0 ECTS credits

35L405 Logistics' Reading Seminar 6 ECTS credits

*Other studies must be discussed with Professor Ari P.J. Vepsäläinen*

#### **2.2 Research-Related Studies, 12 ECTS credits**

The research-related studies can consist of advanced courses in logistics, and/or courses from graduate schools and/or HSE's international networks (e.g. EDAMBA, EIASM, CEMS), and/or book exams, working papers and other publications.

These studies must be discussed and agreed with Professor Ari P.J. Vepsäläinen.

### **Licentiate degree (Lic.Sc) 150 ECTS credits**

It is recommended that students aim directly for the doctoral degree without first doing the licentiate. Doctoral degree students can, however, first produce a licentiate thesis of 90 ECTS credits; a licentiate degree (Lic.Sc) thus consists of 60 ECTS credits of course work (Common Scientific Doctoral Studies as well as Major Subject Studies and Research-Related Studies) and the Licentiate Thesis. The licentiate thesis serves as the proposal for the doctoral dissertation.

35L150 00 The Licentiate Thesis, 90 ECTS credits

### **Doctoral Degree (DSc) 240 ECTS credits**

Doctoral students can progress directly towards a doctorate (DSc (Econ) or PhD). The doctorate consists of 60 ECTS credits worth of course work (Common Scientific Doctoral Studies as well as Major Subject Studies and Research-Related Studies) and the Doctoral Dissertation.

35T000 00 The Doctoral Dissertation, 180 ECTS credits

Professor **Ari P.J. Vepsäläinen** is in charge of the doctoral program in logistics (contact information, see section 2.9).

## **MAJOR SUBJECT STUDIES**

### **35L200 11 Research Seminar**

**0 ECTS credits**

**The Research Seminar is a compulsory part of the Major Subject Studies.**

Students present their research plan and give regular seminar presentations demonstrating the progress of their studies. The objective is to improve the presenting and argumentation skills of the students by own research work. Furthermore, analytical approach and scientific discussion are practiced.

In addition to the three presentations, students are required to participate regularly and actively in the seminars.

**Teaching:** Ari P.J. Vepsäläinen in Fall term 2009 / spring term 2010. More detailed schedule will be set in the beginning of each term.

**Grading:** pass/ fail

### **35L405 Logistics Reading Seminar**

**6 ECTS credits**

The objective is to familiarize students with fundamental theories, methodologies and applications in logistics. Major articles and research findings will be discussed.

Completion of the course requires active participation, preparing summaries and written discourse. The schedule of the course will be decided in the beginning of the academic year when the students will report to Professor Ari P.J. Vepsäläinen.

**Teaching:** Fall term 2009 / spring term 2010

**Grading:** points (0-100)

## **RESEARCH-RELATED STUDIES**

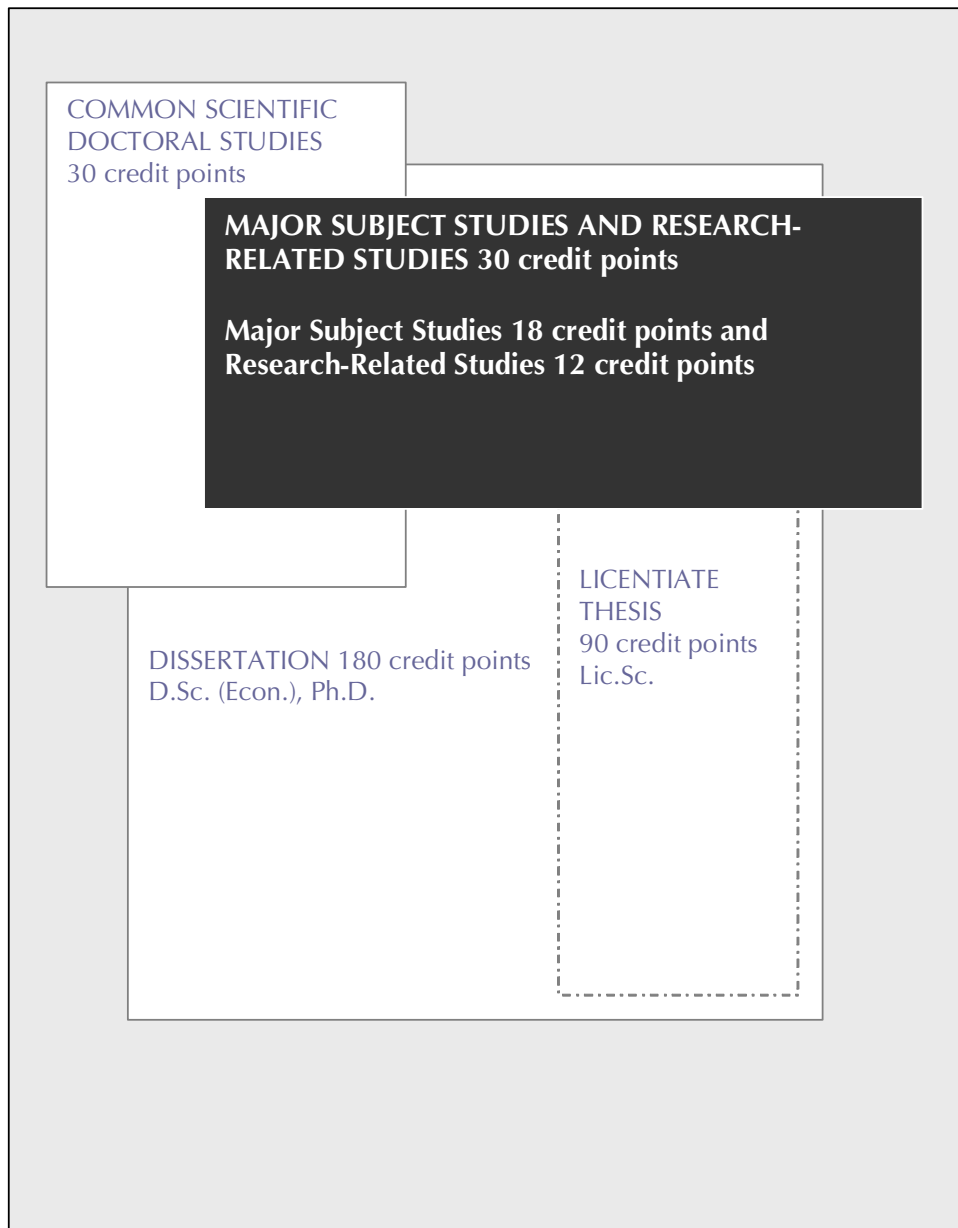
The research-related studies can consist of advanced courses in logistics, and/or courses from graduate schools and/or HSE's international networks (e.g. EDAMBA, EIASM, CEMS), and/or book exams, working papers and other publications.

These studies must be discussed and agreed with Professor Ari P.J. Vepsäläinen.

*For more information, see the Study Guide in Finnish.*

## 9.3 Quantitative Methods of Economics and Management Science

(Taloustieteiden kvantitatiiviset menetelmät)



The quantitative methods unit provides a challenging alternative for students who want to conduct research in fields like applied mathematics and statistics. The main interest areas in research include multiple criteria decision making, performance analysis and financial modeling. In quantitative methods, theoretical and methodological studies are problem-oriented and closely connected to practical problems. The problems originate from practice, and the ultimate goal of theoretical work is to develop methods for modeling reality, and thus for improving the understanding of the practice of management and economics. Typically, students in the postgraduate program choose to specialize in a particular method or area of application. The goal is to meet international research standards and produce articles that are published in refereed journals.

Students of quantitative methods can participate in internationally acknowledged research projects, and it is possible to apply admission to the program, even though one has not studied quantitative methods as a major for the master's degree. For example management science, economics and finance provide a good background for doctoral studies in quantitative methods.

Studies in quantitative methods are designed individually for each student to ensure that they support the selected research topic. Major subject studies consist of graduate level courses, book exams, research reports and conference presentations. All doctoral students are, however, expected to complete at least two graduate-level courses in applied mathematics and statistics.

Professor **Timo Kuosmanen** is in charge of the doctoral program in Quantitative Methods of Economics and Management Science (contact information, see section 2.9).

<http://www.hse.fi/methods>

## **DEGREE REQUIREMENTS AND STRUCTURE**

### **1. Common Scientific Doctoral Studies, 30 ECTS credits**

See Chapter 5.

### **2. Major Subject Studies and Research-Related Studies, 30 ECTS credits**

#### **2.1 Major Subject Studies, 18 ECTS credits**

Major subject studies are chosen from graduate level courses together with the supervisor so that the studies support the student's research work. Research seminar (30L200 11) must be included here. In addition to the courses given at HSE, the courses of various Finnish graduate schools (SIIDA, GSF, SDR) are recommended. It is also possible to take courses abroad, but this requires prior approval by the supervisor. All students must take at least two graduate-level courses in quantitative methods in economics.

#### **2.2 Research-Related Studies, 12 ECTS credits**

Doctoral-level courses in relevant fields of quantitative methods, to be approved by the Professor in charge of the doctoral program.

### **Licentiate degree (Lic.Sc) 150 ECTS credits**

It is recommended that students aim directly for a Doctorate. However, a doctoral student can complete the licentiate degree first.

A licentiate degree (Lic.Sc) consists of 60 ECTS credits of course work (Common Scientific Doctoral Studies as well as Major Subject Studies and Research-Related Studies) and the Licentiate Thesis.

30L150 00 The Licentiate Thesis, 90 ECTS credits

### **Doctoral Degree 240 ECTS credits**

Doctoral students can progress directly towards a doctorate (DSc (Econ) or PhD). The doctoral degree consists of 60 ECTS credits worth of course work (Common Scientific Doctoral Studies as well as Major Subject Studies and Research-Related Studies) and the Doctoral Dissertation.

30T000 00 The Doctoral Dissertation, 180 ECTS credits

## Recommended courses for doctoral students in 2009–2010

### 30L200 11 Research Seminar

0 ECTS credits

**The seminar is a compulsory part of major subject studies and it comprises the following tasks:**

- At the initial stage doctoral students present their research proposal. It is subject to approval by designated supervisor and the professor in charge of doctoral studies in quantitative methods.
- After approval of their proposal, doctoral students make two seminar presentations a year demonstrating progressing in their research.
- The prospective doctoral dissertation must be presented in the research seminar before it is sent to the examiners. The suitability of the research as a dissertation is decided by the supervisor and the professor in charge.

**Grading:** pass/ fail

### 30E00150 Applied Optimization: Fundamentals and Methodologies

6 ECTS credits

**Objective:** The aim is to get acquainted with different types of optimization related problems which are encountered in business, engineering and science. Students will get an in-depth knowledge about different applied optimization methodologies popularly used in practice today. Fundamental optimality conditions will be discussed, followed by step-by-step description of the methods. Besides the classical numerical optimization methodologies, a major emphasis will be given in introducing evolutionary optimization methodologies and their scope in solving applied optimization problems. Issues such as constrained handling, multi-objective optimization and decision-making, customization procedures, hybrid methodologies, uncertainty-based optimization, and large-scale optimization will be covered.

**Content:** Part A: Optimization Fundamentals: Scope of optimization in business, engineering, and science, Fundamentals of optimization. Part B: Non-linear programming: Unconstrained and constrained methodologies, structured optimization, such as integer programming and linear programming. Part C: Evolutionary Optimization: Fundamentals, constrained handling, customization methodologies, multi-objective optimization and decision-making, multi-modal optimization, uncertainty handling leading to robust and reliability-based optimization.

**Grading:** points (0-100)

**Literature:**

Some chapters will be used from the following two texts:

Bazaraa, Sherali and Shetty: Nonlinear programming: Theory and Algorithms

Deb: Multi-objective optimization using Evolutionary Algorithms, Wiley (2001)

A number of research papers will be used and will be supplied in due course of time.

**Teaching:** The course is not lectured during the academic year 2009-2010

**Additional information:** This course replaces the course 30E00100 Optimization, that is no longer lectured.

### **30E00300 Productivity and efficiency analysis**

**6 ECTS credits**

**Objective:** The purpose of the course is (a) to provide students with the basic concepts of the analysis of efficiency and productivity and (b) to familiarize students to apply the quantitative methods for analyzing and improving the efficiency of organizations. A special emphasis on the course is to learn to use Data Envelopment Analysis and its extensions.

**Content:** Topics covered in the course will include basic concepts related to the use of multidimensional measurement of efficiency and productivity (criteria, objectives, dominance, efficiency, productivity, etc.), traditional productivity analysis, evaluation of efficiency with the DEA-method (DEA=Data Envelopment Analysis), and its extensions (Value Efficiency, Improving Efficiency by Benchmarking, Resource Allocation, etc.)

**Grading:** points (0-100)

**Literature:**

1. Cooper W.W., Seiford L.M., Tone K.: Data Envelopment Analysis: A Comprehensive Text with Models, Applications, References and DEA-Solver Software, Kluwer, 2000.
2. Coelli T., Rao D.S.P., Battese G.: An Introduction to Efficiency and Productivity Analysis, Kluwer, 1998.
3. Norman M., Stoker B.: Data Envelopment Analysis, the Assessment of Performance, Wiley, Chichester, 1991.

**Evaluation:**

1. Lectures 42 h, Professor Pekka Korhonen
2. Exercises 12 h, N.N.
3. Grade consists of assignments (20%) and final exam (80%)

**Teaching:** Course is not lectured in 2009-2010

### **30E00400 Simulation**

**6 ECTS credits**

**Objective:** To acquaint the student with the use of simulation methods, with applications to finance, operations management and logistics. To enhance Excel skills in advanced modeling and numerical calculations.

**Content:** Introduction to simulation models, simulation in Excel, random numbers, methods to simulate random events, managerial applications of risk analysis, Wiener process, valuation of stocks and options, system simulation, forecasting, advanced simulation techniques.

**Grading:** points (0-100)

**Literature:**

1. Vose D.: Risk analysis: a quantitative guide, 2<sup>nd</sup> edition, Wiley, 2000.

Supplementary readings:

2. Evans J.R., Olson D.L.: Introduction to simulation and risk analysis, 2<sup>nd</sup> edition, Prentice Hall, 2002.

3. Ross, S.: Simulation, 4<sup>th</sup> edition. Academic Press, 2006.

**Evaluation:**

1. Lectures 40 h, Professor Tomi Seppälä
2. Exercises 20 h, Professor Tomi Seppälä
3. The grade consists of final exam (50%), exercises (20%) and project work (30%).

**Teaching:** Fall term 2009, first and second periods. Details will be announced on course web page <https://cie.hkkk.fi/30E00400>.

**30E00500 Quantitative empirical research**

**6 ECTS credits**

Quantitative empirical research can be used as a part of the major subject studies if it is not used as a part of the common scientific doctoral studies.

**See the course description from Chapter 5.**

**30E00700 Advanced statistical methods**

**6 ECTS credits**

**Objective:** To expand and deepen the student's knowledge of and ability to use statistical methods in economics and business.

**Content:** Topics in linear models and time series analysis: special estimation methods of regression models, panel data, ARMA models, forecasting, cointegration, ARCH and GARCH models. The content may change from year to year.

**Grading:** points (0-100)

**Literature:**

1. Verbeek, M.: A Guide to Modern Econometrics. Second Edition, Wiley 2004.
2. Additional readings: Enders, W.: Applied Econometric Time Series, Second Edition, Wiley 2005.

**Evaluation:**

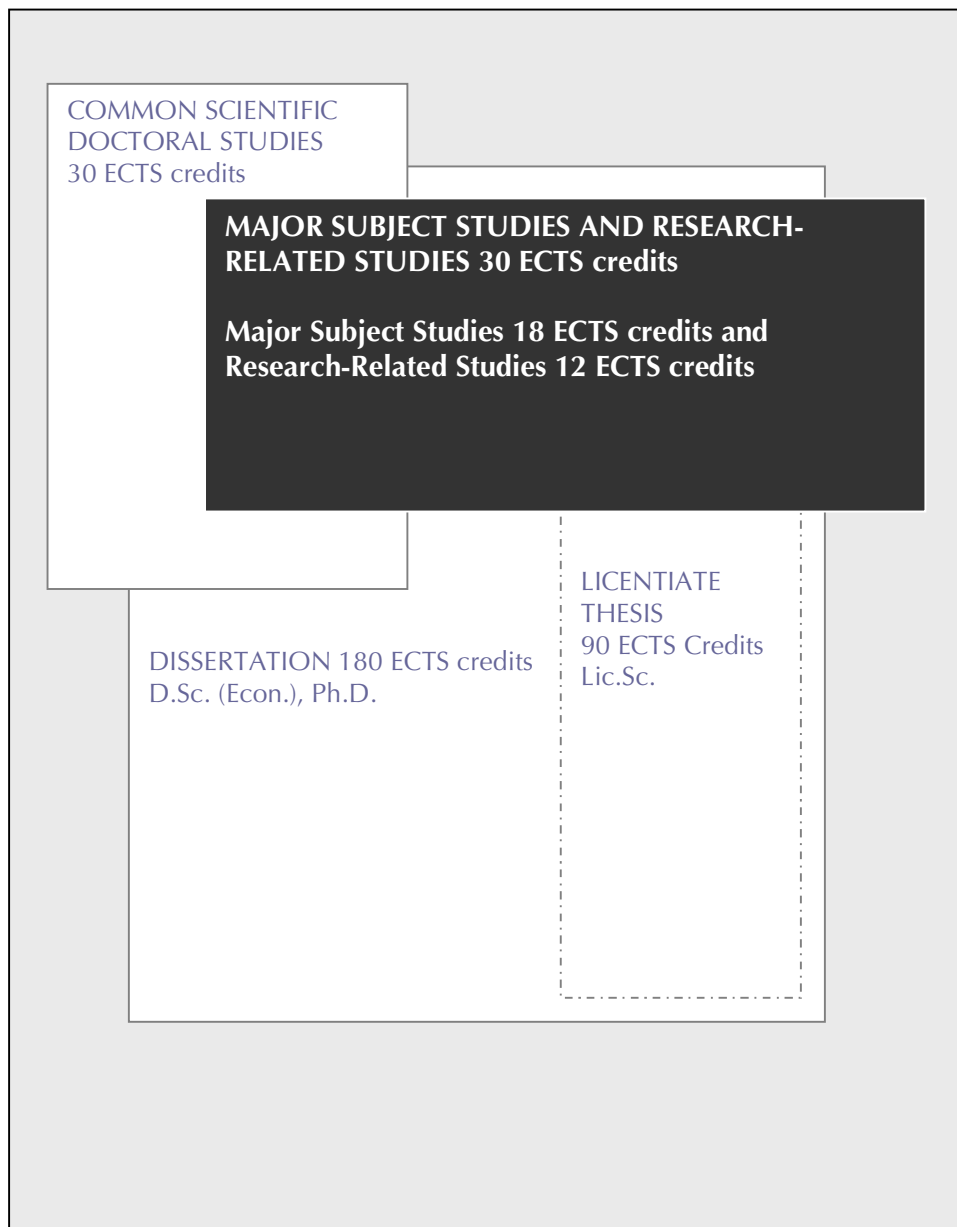
1. Lectures 40 h, PhD Pekka Malo
2. Exercises 20 h, Jan-Erik Antipin
3. The grade consists of final exam (50%), exercises (20%) and project work (30%).

**Teaching:** First period of spring term 2010. Details will be announced on course web page <https://cie.hkkk.fi/30E00700>.

**Research related studies**

These studies will be arranged separately.

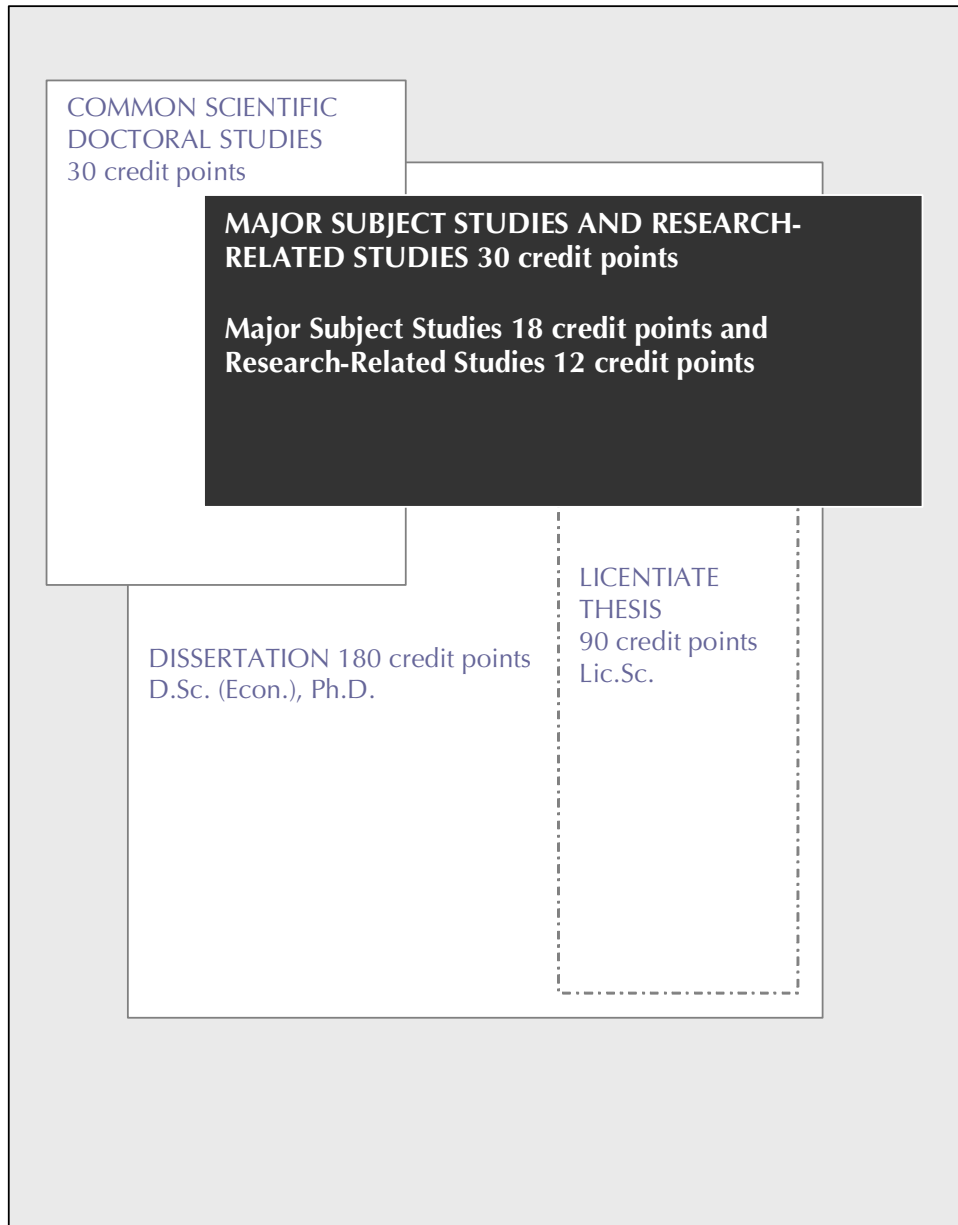
## 9.4 Technology Management and Policy (Teknologiajohtaminen ja –politiikka)



## **DEGREE REQUIREMENTS AND STRUCTURE**

The requirements and courses of the doctoral program in Technology Management and Policy can be found in the HSE Study Guide for Doctoral Students 2005-2006. Due to the transfer of the professorship of Technology Management into the area of Logistics, the situation of each doctoral student in the program of Technology Management and Policy will be reviewed on an individual basis. Please contact Professor Ari P.J. Vepsäläinen (050-589 7485, [ari.vepsalainen@hse.fi](mailto:ari.vepsalainen@hse.fi) ) for a consultation.

## 9.5 Information Systems Science (Tietojärjestelmätiede)



The specialization and focus sectors of research in Information Systems Science (ISS) include electronic and mobile commerce and the development strategies and methods of information-centric products. Information systems management and management of software companies and development and use of information systems with special emphasis on risk management and success evaluation are other important fields. Students contemplating post-graduate studies in Information Systems Science (ISS) are strongly encouraged to choose their topic from those listed above. ISS has an extensive network of international research contacts, offering the possibility to participate in larger research projects and visit an affiliate university.

Post-graduate studies in ISS consist of the research seminar and the Scientific Reading and Writing in ISS course, which familiarizes the student with the conventions of examining and critically evaluating academic texts. In addition, the course helps in outlining the steps required to produce a thorough literature review, as well as providing guidance on the research process and reporting on it. The Research Seminar is the forum where post-graduate students and other senior researchers present and discuss their recent research. International scholars often participate and present their research at the seminar.

With regard to the optional course requirements, studies can be based on national ISS collaboration that takes place through a number of different seminars and graduate schools courses / activities e.g. GEBSI (Graduate School for Electronic Business and Software Industry), INFORTE or GRAMIS (Graduate School of Management and Information Systems). Forthcoming events will be posted on the Business Technology website ([www.hse.fi](http://www.hse.fi)) and informed during research seminars.

**Professor Virpi Tuunainen is in charge of doctoral studies in ISS** (see section 2.9 for contact details).

## **DEGREE REQUIREMENTS AND STRUCTURE**

### **1. Common Scientific Doctoral Studies, 30 ECTS credits**

See Chapter 5.

### **2. Major Subject Studies and Research-Related Studies, 30 ECTS credits**

#### **2.1 Major Subject Studies, 18 ECTS credits**

This section consists of the following compulsory courses:

37L20011 Research Seminar, 0 ECTS credits (all post-graduate students must present their research at least once per academic year)

37E45011 Scientific Reading and Writing in ISS, 6 ECTS credits

Rest of the Major Subject Studies (12 ECTS credits), will be agreed with the professor responsible for PhD studies in ISS.

#### **2.2 Research-Related Studies, 12 ECTS credits**

The research topic studies (37L410) can consist of any advanced, optional ISS courses, national or international ISS seminars, book exams, working papers and other publications. Students require confirmation on the study content from their supervising ISS professor.

### **Licentiate degree 150 ECTS credits**

It is recommended that the student proceeds directly to their doctoral dissertation without taking the optional licentiate degree. However, doctoral students may opt for taking the licentiate degree, which consists of the aforementioned general scientific studies and specialized ISS studies, 60 ECTS credits, and the licentiate thesis.

37L15000 Licentiate thesis, 90 ECTS credits

### **Doctoral degree 240 ECTS credits**

The degrees of D.Sc. (Econ.) and Doctor of Philosophy consist of the aforementioned general scientific studies and the specialized ISS studies, 60 ECTS credits together with the doctoral dissertation.

37T00000 Doctoral dissertation, 180 ECTS credits

## **MAJOR-SUBJECT STUDIES**

### **37L20011 Research Seminar**

**0 ECTS credits**

**The research seminar is a compulsory component of the specialized ISS studies.**

**Objectives and content:** In the research seminar, post-graduate students and other senior researchers present their research proposals or final findings. Students must present and discuss their findings at least once a year. Before any dissertation is allowed to proceed to pre-examination, it must be presented in the seminar.

**Teaching:** Academic year 2009-10, Professor Matti Rossi and Professor Virpi Tuunainen

**Grading:** pass/ fail

**Registration:** Via WebOodi

### **37E45011 Scientific Reading and Writing in ISS**

**6 ECTS credits**

**Course Description:** This is an advanced course consisting of three parts. First the students will read literature, produce reviews, present and discuss them in the class. During the second part students select a topic and produce and present a literature review on it. The third part is devoted to conducting a small-scale study, and writing and presenting a research paper on it.

**Grading:** pass/ fail

**Literature:** Material distributed in the class.

**Teaching:** Academic year 2009-10, Professor Virpi Tuunainen

**Registration:** Via WebOodi

## **RESEARCH-RELATED STUDIES**

The research topic studies (37L410) can consist of any advanced, optional ISS courses, national or international ISS seminars, book exams, working papers and other publications. Students require confirmation on the study content from their supervising ISS professor.