# Catalogue report

**LUT School of Business and Management**

# Master's Programme in Global Management of Innovation and Technology

Industrial Engineering and Management (IEM) combines the fields of technology and business management. The goal of the degree programme is to equip students for organisational development and business process management by merging technology and management skills.

The graduates are professional developers of businesses, organisations and processes. Due to the interdisciplinary nature of the degrees in IEM, they are employed by a wide spectrum of industries, research institutions and public administration. As a result, not tied to any specific industry, the success or failure of individual industries does not have a significant impact on the graduates' career prospects.

The graduates have good career prospects, as they are equipped to learn and adapt to different job profiles and industrial contexts.

## Degree structures

Graduates from the Master's Programme in Global Management of Innovation and Technology will possess a wide variety of perspectives on the management of innovations and technology based on the combination of business, engineering and management. They will be able to cooperate and solve complex situations in today's networked business world due to diverse study methods and working in teams. The programme is international. Students from all continents and B.Sc. graduates from the LUT's own IEM degree programme are able to attend.

The studies in the programme promote the abilities necessary for business decision-making in innovation and technology management: critical and innovative thinking, a global business perspective, an entrepreneurial mindset, enhanced communication skills and the up-to-date knowledge of relevant technical tools and development methods. Already during the studies and the thesis projects, close collaboration with industry ensures the practical real-world application of new knowledge and theories. Additionally, the studies on research methods and scientific writing also construct a firm basis for graduates to continue in postgraduate studies in this field.

The graduates will
• be able to create and analyse strategies within an international context relating to products, services and technologies
• be able to implement and manage decision-making strategies, frameworks and tools in global networks and markets
• be able to analyse processes and structures of organisations and their development issues
• be able to implement, plan and manage the building of product families, product systems, and product platforms for tangible and intangible goods using widely different management methods in companies and networks
• be able to plan and manage international businesses from start-ups to multinational enterprises

• be able to apply innovation and technology management theories, methods and tools of decision-making and analysis to practical management activities.

**Master of Science in Technology 120 ECTS cr, Industrial Engineering and Management 2017-18**

Core studies 33-38 ECTS cr
Specialisation studies 58-63 ECTS cr (min.)
Minor studies 24 ECTS cr (min.)

Double Degree students follow their own degree structure.

# Double Degree Programme in Global Management of Innovation and Technology (GMIT) 2017-18

Degree structure status: published

Academic year: 2017-18

Beginning date of the academic year: 01.08.2017

## Core Studies 30 ECTS cr (min 30 cp)

Studies in partner university.

## Specialisation Studies 70 ECTS cr (min 70 cp)

CS10A0875: Industrial Project Management, 3 cp
A330A0251: Internationalisation of the Firm, 6 cp
CS10A0120: Introduction to M.Sc. Studies in Industrial Engineering and Management, 1 cp
CS90A0060: Master's Thesis, 30 cp
CS30A1661: Open Innovation, 6 cp
CS30A1376: Product Development, 6 cp
CS10A0863: Research Methods for Master Students, 6 cp
CS34A0401: Strategic Entrepreneurship in an Age of Uncertainty, 6 cp
CS30A1341: Strategic Technology and Innovation Management, 6 cp

## Minor Studies (min 20 cp)

Partner university or LUT studies: LUT minor in Technology for the students without former degree in Technology.

## Complementary Studies

Please note that if student’s former degree in university or UAS is not from the field of technology, some non-degree complementary studies may be required for the M.Sc. (Tech.) degree.

## Free Elective Studies

There is no need for free elective studies in Master's programme GMIT 120 ECTS cr. In case a student desires some additional courses over 120 credits, maximum two elective courses per an academic year is recommended.

# Master's Programme in Global Management of Innovation and Technology (GMIT) 2017-18

Degree structure status: published

Academic year: 2017-18

Beginning date of the academic year: 01.08.2017

## Core Studies 38 ECTS cr (min 38 cp)

KIEN0001: Academic Writing in English, 4 cp
CS10A0875: Industrial Project Management, 3 cp
A330A0251: Internationalisation of the Firm, 6 cp
CS10A0120: Introduction to M.Sc. Studies in Industrial Engineering and Management, 1 cp
CS30A1376: Product Development, 6 cp
CS10A0863: Research Methods for Master Students, 6 cp
CS34A0401: Strategic Entrepreneurship in an Age of Uncertainty, 6 cp
CS30A1341: Strategic Technology and Innovation Management, 6 cp

## Specialisation Studies min. 58 ECTS cr (min 58 cp)

TuDGMITSpec: Tuta GMIT, Specialisation Studies, 58 cp
- *Obligatory specialisation studies 42 ECTS cr*
  - CS30A1641: Inventive Product Design and Advanced TRIZ, 6 cp
  - CS30A1661: Open Innovation, 6 cp
  - CS90A0060: Master's Thesis, 30 cp
- *Elective specialisation studies min. 16 ECTS cr*
  - CS10A0270: Economic Challenges in Russia, 3 cp
  - CS10A0760: Business in Russia, 6 cp
  - CS10A0885: Research Project in Industrial Management, 1 - 6 cp
  - CS30A1372: Creative Design and Problem Solving, 6 cp
  - CS30A1391: Systems Engineering, 6 cp
  - CS30A1602: Case Course in Strategy Consulting, 6 cp
  - CS30A1671: Service Innovation and Management, 6 cp
  - CS30A7402: Software and Application Innovation, 6 cp
  - CS35A0153: Product Lifecycle Management, 6 cp
  - A210A0702: New Venture Management, 6 cp
  - A330A0060: Managing Customer Relationships and Business Networks, 6 cp
  - CS30A7370SS: Simulation Modelling in Industrial Management, 3 cp
  - A330A5000SS: International Marketing of High Technology Products and Innovations, 3 cp
- *Exchangeable courses*
  - CS30A1684SS: Advanced Course in Strategic Management, 3 cp
  - CS30A1655: Advanced Course in Strategic Management, 6 cp

## Minor Studies in Technology min. 24 ECTS cr (min 24 cp)

The minor studies **KoDSaManu "Modern Manufacturing"** is highly recommended. This minor is also suitable for the students having no former studies in technology.

Other minors in technology for GMIT-students taught in English (note prerequisities):

- **TiSOSE Software Engineering**, requires former BSc-level studies in computer science/information technology (inc. basic course in programming)
- **YmDSaEnLi Energy and Business,** requires former BSc-level studies in energy technology (at minimum minor level studies)

### Complementary Studies

Please note that if student's former degree in university or UAS is not from the field of technology, some non-degree complementary studies may set as a prerequisities for the M.Sc. (Tech.) degree.

### Free Elective Studies

There is no need for elective studies in Master's programme GMIT 120 ECTS cr. In case a student desires some additional courses over 120 credits, maximum one elective course per an academic year is recommended.

## Master's Programme in Global Management of Innovation and Technology (GMIT) for LUT IEM BSc 2017-18

Degree structure status: published

Academic year: 2017-18

Beginning date of the academic year: 01.08.2017

### Core Studies 33 ECTS cr (min 33 cp)

CS10A0875: Industrial Project Management, 3 cp
A330A0251: Internationalisation of the Firm, 6 cp
CS30A1376: Product Development, 6 cp
CS10A0863: Research Methods for Master Students, 6 cp
CS34A0401: Strategic Entrepreneurship in an Age of Uncertainty, 6 cp
CS30A1341: Strategic Technology and Innovation Management, 6 cp

### Specialisation Studies min. 63 ECTS cr (min 63 cp)

TuDGMITSpec2: Tuta GMIT, Specialisation Studies BCs, 58 cp
*Obligatory specialisation studies 42 ECTS cr*
CS30A1641: Inventive Product Design and Advanced TRIZ, 6 cp
CS30A1661: Open Innovation, 6 cp
CS90A0060: Master's Thesis, 30 cp
*Elective Specialisation studies min. 21 ECTS c*
CS10A0270: Economic Challenges in Russia, 3 cp
CS10A0760: Business in Russia, 6 cp
CS10A0885: Research Project in Industrial Management, 1 - 6 cp
CS30A1372: Creative Design and Problem Solving, 6 cp
CS30A1391: Systems Engineering, 6 cp
CS30A1602: Case Course in Strategy Consulting, 6 cp
CS30A1671: Service Innovation and Management, 6 cp
CS30A7402: Software and Application Innovation, 6 cp
CS35A0153: Product Lifecycle Management, 6 cp
A210A0702: New Venture Management, 6 cp
A330A0060: Managing Customer Relationships and Business Networks, 6 cp

CS30A7370SS: Simulation Modelling in Industrial Management, 3 cp
A330A5000SS: International Marketing of High Technology Products and Innovations, 3 cp
*Exchangeable courses*
CS30A1684SS: Advanced Course in Strategic Management, 3 cp
CS30A1655: Advanced Course in Strategic Management, 6 cp

### Minor Studies in Technology min. 24 ECTS cr (min 24 cp)

Minor in Technology is required. A student should choose an extensive minor on the field of B.Sc. minor studies or he/she can choose a B.Sc. level technical minor (meaning different studies from the B.Sc. degree included). Please check the more detailed information from GMIT Study guide -> Minor studies.

### Free Elective Studies

There is no need for elective studies in Master's programme GMIT 120 ECTS cr. In case a student desires some additional courses over 120 credits, maximum one elective course per an academic year is recommended.

# Courses and study modules not included in degree structures

**Minor studies for students coming directly to GMIT M.Sc. degree:**

The minor studies **KoDSaManu "Modern Manufacturing"** is highly recommended. This minor is also suitable for the students having no former studies in technology.

Other minors in technology for GMIT-students taught in English (note prerequisities):

- **TiDSOSE Software Engineering**, requires former B.Sc.-level studies in computer science/information technology (including basic course in programming)
- **YmDSaEnLi Energy and Business,** requires former B.Sc.-level studies in energy technology (at minimum minor level studies)

**Minor studies for students continuing their studies from LUT B.Sc. degree:**

Minor in Technology is required. A student should choose an extensive minor on the field of B.Sc. minor studies or he/she can choose a B.Sc. level technical minor (meaning different studies from the B.Sc. degree included).

| **Minor in Technology (BSc)** | **Extensive minor in Technology** |
|---|---|
| Prerequisites:<br>No former subject oriented studies required. | Prerequisites required:<br>BSc level minor in the same subject area. |
| Tietotekniikka (TikSOTite) | Software Engineering (TiDSOSE) |
| Konetekniikka (KoDSaKote) | Modern Manufacturing (KoDSaManu) |

| | |
|---|---|
| Energia- ja ympäristötekniikan perusteet (YmKSaEnYmPe) | Energiatekniikan tekniset ratkaisut (YmDSaTekRat)<br><br>Energia ja liiketoiminta (YmDSaEnLi) |
| Kemian prosessitekniikka (KeSoM300) | ----- |

YmDSaEnLi: , 20 - 30 cp
*Obligatory Studies 14 ECTS cr*
BH60A2601: Climate Change, 5 cp
BH60A4700: Climate Finance and Carbon Markets, 3 cp
BL20A1300: Energy Resources, 6 cp
*Valitaan vaihtoehtoisia opintojaksoja siten, että sivuopintojen vaadittava minimiopintopistemäärä tulee täyteen tutkinto-ohjelman vaatimusten mukaisesti.*
BH40A0101: Renewable Energy, 3 cp
BH60A1800: Introduction to Environmental Law, 5 cp
BH61A0200: Energy Economics, 4 cp
BL20A0201: Power Exchange Game for Electricity Markets, 3 cp
BL20A0400: Electricity Market, 5 cp
BL20A1400: Renewable Energy Technology, 6 cp
BL20A1500: Energy Scenarios, 6 cp
BL20A1600: Smart Grids, 5 cp
BL40A2301: Energy Efficiency, 6 cp
YmDSaTekRat: , 20 - 30 cp
*Obligatory Studies 11 ECTS cr*
BH40A0101: Renewable Energy, 3 cp
BH50A0200: Power Plant Engineering, 4 cp
BH60A2401: Energy Recovery from Solid Waste, 4 cp
*Valitaan vaihtoehtoisia opintojaksoja siten, että sivuopintojen vaadittava minimiopintopistemäärä tulee täyteen tutkinto-ohjelman vaatimusten mukaisesti.*
BH50A0500: Introduction to Combustion and Boiler Technology, 5 cp
BH50A1701: District Heating, 4 cp
BH50A1800: Fundamentals of Energy Systems Planning, 6 cp
BH50A1900: Planning of Energy Systems, 4 cp
BH61A0600: Bioenergy, 3 cp
BL20A0700: Introduction to Electrical Power Systems, 4 cp
BL30A0500: Introduction to Electrical Drives, 3 cp
BL40A2301: Energy Efficiency, 6 cp
YmKSaEnYmPe: , 20 - 30 cp
*Pakolliset opinnot 17 op.*
BH20A0710: Fundamentals of Thermodynamics, 3 cp
BL40A2600: Wind power and solar energy technology and business, 5 cp
BH60A0001: Basic Course in Environmental Technology, 6 cp
*Vaihtoehtoisia opintoja valitaan siten, että sivuopintojen vaadittava minimiopintopistemäärä tulee täyteen tutkinto-ohjelman vaatimusten mukaisesti.*
BH50A0200: Power Plant Engineering, 4 cp
BH60A1600: Basic Course on Environmental Management and Economics, 5 cp
BH61A0000: Fundamentals of Energy Economics, 2 cp
BL10A0100: Basics of Electric Engineering, 3 cp
KoDSaKote: , 20 - 30 cp
*Pakolliset opinnot 19 op*
BK10A3500: Materials, 7 cp
*Elective*
BK10A3500-A: Materials, part A, 4 cp
BK10A3500-B: Materials, part B, 3 cp

BK50A3401: Technical Documentation and 3D-modelling, 6 cp
BK80A2900: Basic Course in Strength of Materials, 3 cp
BK80A3200: Basics of Mechanics, 3 cp
*Valitaan seuraavista opintoja siten, että sivuaineopintojen vähimmäisopintopistemäärä täyttyy.*
BK10A3601: Production Technologies, 11 cp
*Elective*
BK10A3601-A: Production Technologies, part A, 5 cp
BK10A3601-B: Production Technologies, part B, 6 cp
BK60A0200: Mechatronics, 6 cp
BK65A0203: Engineering Design, 7 cp
BK80A2601: Mechanics, 7 cp
BK80A2701: Strength of Materials, 9 cp
*Elective*
BK80A2701-A: Strength of Materials, part A, 4 cp
BK80A2701-B: Strength of Materials, part B, 5 cp
BK80A2800: FE-analysis, Elementary Course, 5 cp
KeSoM300: ?, 21 - 31 cp
*Kaikille pakolliset opinnot 21 op*
BJ01A5010: Introduction to Chemical Process Industries, 3 cp
BJ01A5020: Process and Plant Design, 4 cp
BJ01A5030: Introduction to Process Simulation, 4 cp
BJ01A5040: Process Safety, 2 cp
BJ01A5051: Biorefineries, 3 cp
BJ02A2061: Product Design, 5 cp
*Vapaavalintaiset opinnot 5-10 op*
BJ02A2051: Process Intensification, 5 cp
BJ02A4051: Development of New Sustainable Products and Solutions, 5 cp
TikSOTite: Computer Science, 24 - 30 cp
*Vaihtoehtoiset (väh. 24 op). Jos opintojakso sisältyy esim. pakollisiin ydinopintoihin, valitaan muuta tilalle. Suositeltu suoritusjärjestys alla. Huomioi esitietovaatimukset!*
LM10A2000: Introduction to Information Systems, 3 cp
CT60A0201: Introduction to Programming, 6 cp
CT60A0220: Principles of C-Programming and Testing, 6 cp
CT30A2802: User Interfaces and User-Centric Desing, 6 cp
BM40A0301: Data Structures and Algorithms, 6 cp
CT60A2411: Object-Oriented Programming, 6 cp
CT60A4303: Introduction to databases, 3 cp
CT60A7650: Database Systems Management, 3 cp
CT60A4002: Software Engineering, 6 cp
LM10A1000: Project Management, 6 cp
CT30A3202: Webbed Applications, 6 cp
BM40A0300: Data Structures and Algorithms, 5 cp
BH20A0750: Engineering Thermodynamics, 6 cp
CS30A7390SS: Inventive Product Design and Advanced TRIZ, 3 cp
KoDSaManu: Modern Manufacturing, 20 - 30 cp
*Obligatory Studies 25 ECTS cr*
BK50A4000: Production Processes in Modern Job Shops, 5 cp
BK50A4100: Manufacturing Systems and Scheduling, 5 cp
BK50A4200: Product Flow in Job Shops, 5 cp
BK50A4300: Managing Job Shops, 5 cp
BK50A4401: Fabrication Laboratory, 5 - 10 cp
TiDSOSE: Software Engineering, 24 - 30 cp
*Obligatory courses 18 ECTS cr*
CT10A7002: Green IT and Sustainable Computing, 6 cp
CT60A5102: Models and Methods of Software Engineering, 6 cp
CT60A5300: Software Projects, Processes and Entrepreneurship, 6 cp
*Elective courses, min 6 ECTS cr*
CT10A7040: Code Camp, 1 - 5 cp
CT30A8910: Software as a Service: Architectures and Engineering, 6 cp

CT60A5400: Fundamentals of Game Development, 6 cp
CT60A7322: Software Business Development, 3 cp
CT60A7510: Design Patterns, 6 cp
CS30A7402: Software and Application Innovation, 6 cp
CS30A7380SS: Systematic Creativity - TRIZ Basics, 3 cp

# Course descriptions

## Descriptions of courses and study modules included in the degree structures

### CS10A0875: Industrial Project Management, 3 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Olli-Pekka Hilmola, Daria Podmetina, Ekaterina Albats, Roman Teplov

**Year:**
M.Sc. (Tech.) 1-2
**Period:**
3
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Daria Podmetina
Professor, D.Sc. (Tech.) Olli-Pekka Hilmola
**Aims:**
This course provides an introduction the fundamental aspects of modern project management. In practical assignments students will learn, how to apply the project management skills. This course aims to:
• introduce the concepts and tools available to project managers for organizing, planning, and controlling projects (PERT, Gantt, critical path, critical chain and DSM matrixes).
• study the managerial, cultural, and social aspects of Project Management.
• discuss the importance of the organization’s strategy during the project selection.
• teach the critical role of work breakdown structures and networks in planning, scheduling, and estimating the status of projects.
• create an awareness of potential conflicts and scheduling problems that occur on projects.
• demonstrate how to reliably estimate the status of projects.
• demonstrate the MS Project, and DSM software for planning and scheduling projects.
management of multi-project environment and multitasking
• finance of technology development projects
**Contents:**
This course covers the fundamental concepts and applied techniques for cost effective management of both long-term development programs and short-term projects. The content deals with planning, scheduling, organizing, and controlling projects. The course uses cases from a wide variety of industries. Project management principles and methodology are provided with special focus on planning, controlling, and managing projects to successful completion. After successfully completing this course, the student will be able to:
• Identify the elements of the PM life cycle, including: Plan, Control, and Organize and Allocate Resources
• Understand PM processes

• Comprehend basic tools and techniques to plan, organize and manage a project
• Optimize results while managing the triple constraints
• Manage stakeholder communications
• Describe the principles of Team Leadership

**Teaching Methods:**
Lectures 14 h, computer exercises and case analysis 32 h (each group needs to analyze one real technology development project regarding its risks and present it in joint-seminar), individual work and seminar preparation 22 h, total 68 h. Moodle is used in this course.

**Examination in Examination schedule (Yes/No):**
No

**Examination in Moodle (Yes/No):**
No

**Examination in Exam (Yes/No):**
No

**Assessment:**
0-5, based on the report (70 %), and home assignments/group work during the course (30 %). Note, there will not be written exam in the end of the course

**Course Materials:**
Kerzner, Harold R. (2013). Project Management: A Systems Approach to Planning, Scheduling, and Controlling. Wiley, New Jersey. Eppinger, Steven D. & Tyson R. Browning (2012). Design Structure Matrix Methods and Applications. MIT press, Boston. Other course materials will be announced on the first lecture.

**Prerequisites:**
The course is targeted to the students of Global Management of Innovation and Technology (GMIT) master program, but other students can also participate. Students not from GMIT program have to apply with motivation letter to the teachers. Number of participants is limited.

**Places for exchange-students? (Yes, number/No):**
Yes, 5.

## A330A0251: Internationalisation of the Firm, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Sami Saarenketo, Anisur Faroque, Juha Väätänen, Igor Laine, Iustin Vadana, Maria Uzhegova

**Note:**
Interchangeable with CS10A0551 International Business Methods and A330A0250 Internationalization of the Firm and Global Marketing. Course will be lectured twice a year, in periods 2 and 3.

**Year:**
M.Sc. (Tech.) 1, M.Sc. (Econ. & Bus. Adm.) 1

**Period:**
2, 3

**Teaching Language:**
English

**Teacher(s) in Charge:**
Post-doctoral researcher, D.Sc. (Econ. & Bus. Adm.) Igor Laine (2nd period 2017)
Junior researcher, D.Sc. (Econ. & Bus. Adm.) Anisur Faroque (3rd period 2018)
Professor, D.Sc. (Econ. & Bus. Adm.)) Sami Saarenketo
Professor, D.Sc. (Tech.) Juha Väätänen

**Aims:**
Learning outcomes: After completing the course the student will understand the processes of firm internationalization and global marketing. The learning outcomes of the course are the following:
1. To recognize the characteristics of the international market environment and of international business
2. To recognize the dimensions and drivers of market globalization
3. To assess and criticize the essential theories and frameworks of firm internationalization

4. To evaluate the ways in which international trade and investments affect world markets
5. To evaluate the risks and opportunities in global markets
6. To evaluate how to conduct sustainable international business
7. To analyze the key management decisions connected with the internationalization of the firm and global marketing: Whether to internationalize, deciding which markets to enter, deciding how to enter the foreign market
8. To be able to collaborate in cross-cultural teams
9. To create and deliver a group presentation focusing on the internationalization decisions of a given company.

**Contents:**
Must know: International trade and investments, Drivers of globalization, Chain of strategic decisions related to internationalization of the firm, internationalization motives and barriers, Risks assessment in international markets, Internationalization theories (Uppsala model, Network approach, Born Global), international market selection process, factors influencing entry mode choice, characteristics of various entry modes (export modes, intermediate entry modes, hierarchical modes);
Should know: Global business relations and trade agreements, Concept of value chain in internationalization, comparison of SMEs and LSEs in internationalization and global marketing, environmental analysis in deciding which market to enter (political, economic, sociocultural, and technological environment);
Additional knowledge: Principles of transaction cost analysis.

**Teaching Methods:**
21 h lectures, 12 h exercises, 30 h written assignments, 30 h written report, 32 h course literature, 35 h self study and exam preparation. Total 160 h.

**Examination in Examination schedule (Yes/No):**
Yes

**Examination in Moodle (Yes/No):**
No

**Examination in Exam (Yes/No):**
No

**Assessment:**
0 - 5. Examination 50 %, exercises 30 %, research report 20 %. Each of the components has to be passed acceptably.

**Course Materials:**
1) Hollensen, S. (2017) Global Marketing, 7th edition, Pearson Education (older editions apply as well)
2) Cavusgil S.T., Knight G., Reisenberger J. (2017) – International Business: The New Realities, 4th edition, Pearson Education (older editions apply as well)
Additional materials will be announced on lectures. Additional reading and material assigned in class.

**Prerequisites:**
Sufficient prior business studies and basic knowledge of international marketing required. Due to the teaching methods, the amount of participants may be limited to 75 participants. In this case the priority would be given to the students of the School of Business and Management

**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 75

**Places for exchange-students? (Yes, number/No):**
Yes

**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**
to sustainability

## CS10A0120: Introduction to M.Sc. Studies in Industrial Engineering and Management, 1 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Marja Talikka, Leonid Chechurin, Ville Ojanen

**Year:**
M.Sc. (Tech.) 1
**Period:**
1-4
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Ville Ojanen
Professori Leonid Chechurin
Information Specialist, M.Sc. (Tech.) Marja Talikka
**Aims:**
The course provides the student with basic knowledge of studying at Lappeenranta University of Technology (LUT), Finland, in general and particularly in his/her school and degree programme. The course is aimed to help students to plan their studies at LUT and follow the progress of their studies with the help of a individual study plan.
Students recognize their own learning strategy and learn about information retrieval and the information sources available at LUT for courses and studying by using the Academic Library's services, collections and databases.
**Contents:**
The Orientation Days activities. Practical study-related information. Degree requirements. Planning of Master's studies.
Preparation of the individual study plan. Monitoring the progess of studies with the Academic Director and Student Affairs Secretary.
The Academic Library collections and databases.
**Teaching Methods:**
Participation in the Orientation Days. Planning the individual study plan.
Library introduction lectures and assignments on information retrieval and library databases on Moodle (Period 1).
Study programme meetings with the Academic Director and Study Councellor (Periods 1-4).
Assignments: individual study plan, library assignments. Independent study. Total 26 h.
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
Pass/Fail (assignments, active participation in study programme meetings)
**Course Materials:**
Materials will be announced during the course.
**Places for exchange-students? (Yes, number/No):**
No
**Places for Open University Students?(Yes, number/No):**
No

## CS90A0060: Master's Thesis, 30 cp

**Validity:** 01.08.2008 -

**Form of study:** Basic studies

**Type:** Master's Thesis

**Unit:** LUT School of Business and Management

**Teachers:** Timo Pirttilä

**Year:**
M.Sc. (Tech.) 2
**Period:**
1-4
**Teaching Language:**

Finnish
**Teacher(s) in Charge:**
Professor, D.Sc. (Tech.) Timo Pirttilä
Other teachers: Professors and Associate Professors of Industrial Engineering and Management
**Aims:**
In their Master's thesis, students demonstrate their knowledge of a topic of scientific and societal importance in a specific professional area. The student
must demonstrate the ability to carry out the project independently and following a plan. The thesis must be organised coherently, the presentation
academic and the language revised.
**Contents:**
The Master's thesis is the final project of the degree of Master of Science (Technology). Usually it involves a development project commissioned by a
company and takes about six months. The work entails working on a development project related to industrial management, preparing a report in the form of a
thesis, and presenting the work in a way that the professor of the major subject requires.
Topic of the master's thesis has to be confirmed as soon as the topic has been decided with the supervisor. Use form 1A in UNI-portal.
**Teaching Methods:**
Development project and related report, presentation of the work (professor of the major subject defines the way), maturity test (usually on the contents of the thesis).
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0 - 5. Master's thesis 100 %.
**Prerequisites:**
B.Sc. (Tech.) degree (not required of students admitted directly into a Master's programme), complementary studies (for students admitted directly into
a Master's programme).
**Places for exchange-students? (Yes, number/No):**
No
**Places for Open University Students?(Yes, number/No):**
NO
**Related to:**
to sustainability

## CS30A1661: Open Innovation, 6 cp

**Validity:** 01.08.2013 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ekaterina Albats, Antero Kutvonen, Daria Podmetina, Justyna Dabrowska

**Year:**
M.Sc. (Tech.) 2, M.Sc. (Econ. & Bus. Adm.) 2
**Period:**
Periods 1-2, Periods 3-4
**Teaching Language:**
English
**Teacher(s) in Charge:**
Researcher, D.Sc. (Tech.) Antero Kutvonen

**Aims:**
Student
1. can explain the concept of open innovation through both theory and examples (to e.g. a company executive)
2. identifies open innovation activities in real life companies and explain the motives for engaging in them and the mechanisms through which they create value for the company
3. can distinguish between modes of inbound and outbound open innovation
4. can analyze the relation between a company's strategic choices and application of open innovation
5. attains a basic familiarity with the scientific literature on the theme and the ability to view open innovation in the context of other innovation management theories.

**Contents:**
Must know: The fundamental definitions and concept of open innovation. Modes of inbound open innovation, i.e. external acquisition of knowledge, and outbound open innovation, i.e. external exploitation of knowledge. Difference between closed and open innovation in managing technology. Identifying open innovation activities in real life firms. Monetary and strategic motives for engaging in open innovation.
Should know: Process models of inbound and outbound open innovation. The role and importance of the individual process phases. The relation between corporate strategy, technology strategy and open innovation activities. Most common examples of firms used to explain open innovation. Varying topics from state-of-the-art open innovation research, depending on guest lecturer. Basics of IPR management in open innovation.
Nice to know: Development of the open innovation concept on the basis of prior innovation management theories. Knowledge of the main scientific literature surrounding open innovation. Theoretical determinants of open innovation.

**Teaching Methods:**
Lectures and guest speakers 35 h as intensive teaching. Small group assignments during lectures. Group exams (or substituting them with summaries of scientific articles, 24 h) on three of the intensive days, preparing for exams 24 h. Independent study 72 h. Total 155 h.

**Suitability for doctoral studies (Yes/Leave empty):**
Yes

**Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):**
Yes

**Examination in Examination schedule (Yes/No):**
No

**Examination in Moodle (Yes/No):**
No

**Examination in Exam (Yes/No):**
No

**Assessment:**
0 - 5. Continuous evaluation based on small group exams (80%) and participation in lectures (20%). Possibility to substitute group exams with literary work (summaries of scientific articles) in case of absence.

**Course Materials:**
The course book and reading material will be announced at the first lecture.

**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 40 students, prioritized based on motivation letter submitted during registratio

**Places for exchange-students? (Yes, number/No):**
Yes

**Places for Open University Students?(Yes, number/No):**
Yes, 0-5 places – admittance based on motivation letter

## CS30A1376: Product Development, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Andrzej Kraslawski

**Year:**

M.Sc. (Tech) 1
**Period:**
1-2
**Teaching Language:**
English
**Teacher(s) in Charge:**
Professor, Ph.D. Andrzej Kraslawski
**Aims:**
After fulfilling all requirements of the course, the students will be able to: 1. Understand the concept of new product development 2. Recognise the phases of new product development 3. Work in a team during product development 4. Apply the basic methods of product development.
**Contents:**
The key topics of the course are: 1. Major Phases of New Product Development, 2. Engineering Concept Development and Testing (design for manufacturability, user-centred engineering, visualisation of design, robust design), 3. Integration of Technical Design and Business Analysis, 4. Intellectual Property in New Product Development, 5. Project Management, 6. Introducing a New Product to the Market
**Teaching Methods:**
The course is organised as a combination of regular lectures and interactive problem-solving sessions and project work. The classroom problem-solving sessions will be based on team-work in groups of 3-5 students. The 3-4 projects will be carried out in groups of 3-4 students independently and will result in the preparation of the project report. Classroom teaching and problem-solving sessions 36 hours. Project work 94 hours. Period 1. in-class activities (lectures, problem solving), period 2. out-of-class activities (project work). Total workload 130 hours.
Lectures, in-class activity, period 1.
Project work, out-of-class activity period 2.
Project work 94 hours.
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0-5. Evaluation: solutions created in the classroom problem-solving sessions 40%, project reports 40%, written exam 20%. Attendance requirement: 90% of classroom sessions.
**Course Materials:**
Course slides
K. Ulrich, S. Eppinger: Product Design and Development, McGraw-Hill, 2012
**Prerequisites:**
Basic understanding of management. Basic knowledge of engineering disciplines.
**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 60
**Places for exchange-students? (Yes, number/No):**
Yes, 30
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS10A0863: Research Methods for Master Students, 6 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Roman Teplov, Daria Podmetina, Ekaterina Albats

**Year:**

M.Sc. (Tech.) 1-2
**Period:**
1-2
**Teaching Language:**
English
**Teacher(s) in Charge:**
Post-Doctoral Researcher, D.Sc. (Tech.) Daria Podmetina
PhD Student Ekaterina Albats
PhD Student Roman Teplov

Person in Charge: Post-Doctoral Researcher, D.Sc. (Tech.) Daria Podmetina
**Aims:**
The course aims to provide methodological support and clear guidelines to master students on how to conduct the research in management and how to report its results. In the end of the course, students should be able to find and critically analyze empirical literature; to formulate clear research questions and research design; to collect and analyze qualitative and quantitative data; to interpret and report the results of the research.
**Contents:**
The course includes following topics: the nature of business and management research; formulating and clarifying the research topic; reviewing the literature; understanding research philosophies and approaches; formulating the research design; research ethics; collecting primary data and using secondary data; analyzing quantitative and qualitative data; writing project report and presenting the results. The course also has several in-class and home individual and group assignments targeted at developing the skills in conducting research and writing high quality master thesis.
**Teaching Methods:**
Lectures 36 h, exercises 6 h, research report and presentation 35 h, written assignments 25 h, course literature 30 h, self-study and exam preparation 25 h. Total 157 h. Moodle is used in this course.
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0-5. Based on written exam in the end of the course (40 %), research project report and its presentation (40%), home written assignments (master thesis analysis, article analysis, cases) and active participation during lectures (20%).
**Course Materials:**
Course book: Saunders, M, Lewis, P. and Thornhill, A. (2009). Research methods for business students, 5th ed., FT /Prentice Hall. Additional materials will be announced on the lectures.
**Prerequisites:**
The course is targeted to the students of Global Management of Innovation and Technology (GMIT) master program, but other students can also participate. Students not from GMIT program have to apply with motivation letter to the teachers. Number of participants is limited.
**Places for exchange-students? (Yes, number/No):**
No
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS34A0401: Strategic Entrepreneurship in an Age of Uncertainty, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Justyna Dabrowska, Ekaterina Albats, Marko Torkkeli

**Year:**
M.Sc. (Tech.) 1
**Period:**
1
**Teaching Language:**
English
**Teacher(s) in Charge:**
Professor, D.Sc. (Tech.) Marko Torkkeli
**Aims:**
Managing in a knowledge-based economy, Managing by Core Competences, Knowledge intensive firms, Uncertainty. Are they the latest buzz words or another passing managerial fad? Old wine in new bottles? Or perhaps, just perhaps, a fundamental means of survival and success for modern day corporations? Given the amount of effort that has been devoted to the topic by both academics and practitioners, it appears worth taking a deep and dispassionate look at the role of entrepreneurial thinking in sustained competitive advantage. The goal is to learn as you go and effectively convert assumptions to knowledge at a low cost. During the course students learn to develop and test a business idea following the discovery driven planning steps as well as using the uncertainty management tools of Attribute Mapping, Supply Chain Analysis, Differentiation, Quizzing and Market-Busters. The course does not teach business plan writing but rather focuses on opportunity recognition and feasibility assessment. Moreover, it adds the elements of lean and guerilla marketing as well as social entrepreneurship as possible avenues in dealing with entrepreneurial challenges.
**Contents:**
During the course students learn to develop and test a business idea following the feasibility analysis, discovery driven planning steps as well as using the uncertainty
management tools of Attribute Mapping, Supply Chain Analysis, Differentiation, Quizzing and Market-Busters. The course does not teach business plan writing but rather focuses on opportunity recognition and feasibility assessment. Moreover, it adds the elements of lean and guerilla marketing as well as social entrepreneurship as possible avenues in dealing with entrepreneurial challenges.

Entrepreneurial thinking, uncertainty management, strategic entrepreneurship,
discovery-driven planning.
**Teaching Methods:**
Lectures 20 h, Independent study 73 h, seminar work writing 63 h, 1. period. Total 156 h.
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0 - 5. Based on assignment and in-class work, participation in the lectures required.
**Course Materials:**
Lectures and additional reading provided in the class. Book: McGrath Rita and MacMillan Ian, (2000). The Entrepreneurial Mindset. Harvard Business School Press.; McGrath Rita and MacMillan Ian, (2005). MarketBusters: 40 strategic moves that drive exceptional business growth. Harvard Business Press.
**Places for exchange-students? (Yes, number/No):**
Yes, 15
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS30A1341: Strategic Technology and Innovation Management, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ville Ojanen, Kalle Elfvengren

**Note:**
Will replace the previous 8 ECTS cr course
**Year:**
M.Sc. (Tech.) 1
**Period:**
3-4
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Ville Ojanen
**Aims:**
Student can 1. design and analyze technology and innovation strategy of a company, 2. apply different tools and frameworks of technology management, 3. Develop and plan alternative progress routes for managing technology, innovations, as well as product and service portfolios.
**Contents:**
Core material: Innovation as a core business process. Innovative organisation. Development of technology and innovation strategy. Innovation networks. Decision-making in technological and market uncertainty. Creation of new products and services. New technology-based ventures. Innovation performance and learning. Methods of technology management.
**Teaching Methods:**
Lectures and exercises 12 h, 3rd period. Lectures and exercises 10 h, 4th period. Seminars 12 h, 4 period. Preparation for lectures and exercises 12 h. Seminar work and other assignments 110 h. Total 156 h.
**Suitability for doctoral studies (Yes/Leave empty):**
Yes
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0-5. No exam. Seminar works and other written reports and presentations 100%.
**Course Materials:**
Joe Tidd and John Bessant. Managing Innovation – Integrating Technological, Market and Organizational Change, 4th ed. 2009, or newer. Lecture notes and other material announced in the beginning of the course.
**Prerequisites:**
Recommended: CS30A0952 Innovaatio- ja teknologiajohtamisen peruskurssi (Finnish course). Recommended: B. Sc. in Industrial Engineering and Management or equivalent basic knowlege of innovation and technology management.
**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 50, priority to GMIT students.

**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.
**Related to:**
to sustainability

## KIEN0001: Academic Writing in English, 4 cp

**Validity:** 01.08.2017 -

**Form of study:** Language and communication studies

**Type:** Course

**Unit:** Language Center

**Grading:** Study modules 0-5,P/F

**Teachers:** Tarja Kovalev, Riitta Gröhn, Kristiina Karjalainen

No course descriptions.

## CS10A0875: Industrial Project Management, 3 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Olli-Pekka Hilmola, Daria Podmetina, Ekaterina Albats, Roman Teplov

**Year:**
M.Sc. (Tech.) 1-2
**Period:**
3
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Daria Podmetina
Professor, D.Sc. (Tech.) Olli-Pekka Hilmola
**Aims:**
This course provides an introduction the fundamental aspects of modern project management. In practical assignments students will learn, how to apply the project management skills. This course aims to:
• introduce the concepts and tools available to project managers for organizing, planning, and controlling projects (PERT, Gantt, critical path, critical chain and DSM matrixes).
• study the managerial, cultural, and social aspects of Project Management.
• discuss the importance of the organization's strategy during the project selection.
• teach the critical role of work breakdown structures and networks in planning, scheduling, and estimating the status of projects.
• create an awareness of potential conflicts and scheduling problems that occur on projects.
• demonstrate how to reliably estimate the status of projects.
• demonstrate the MS Project, and DSM software for planning and scheduling projects.
management of multi-project environment and multitasking
• finance of technology development projects
**Contents:**
This course covers the fundamental concepts and applied techniques for cost effective management of both long-term development programs and short-term projects. The content deals with planning, scheduling, organizing, and controlling projects. The course uses cases from a wide variety of industries. Project management principles and methodology are provided with special focus on planning, controlling, and managing projects to successful completion. After successfully completing this course, the student will be able to:
• Identify the elements of the PM life cycle, including: Plan, Control, and Organize and Allocate Resources
• Understand PM processes
• Comprehend basic tools and techniques to plan, organize and manage a project
• Optimize results while managing the triple constraints
• Manage stakeholder communications
• Describe the principles of Team Leadership
**Teaching Methods:**
Lectures 14 h, computer exercises and case analysis 32 h (each group needs to analyze one real technology development project regarding its risks and present it in joint-seminar), individual work and seminar preparation 22 h, total 68 h. Moodle is used in this course.
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**

No
**Assessment:**
0-5, based on the report (70 %), and home assignments/group work during the course (30 %). Note, there will not be written exam in the end of the course
**Course Materials:**
Kerzner, Harold R. (2013). Project Management: A Systems Approach to Planning, Scheduling, and Controlling. Wiley, New Jersey. Eppinger, Steven D. & Tyson R. Browning (2012). Design Structure Matrix Methods and Applications. MIT press, Boston. Other course materials will be announced on the first lecture.
**Prerequisites:**
The course is targeted to the students of Global Management of Innovation and Technology (GMIT) master program, but other students can also participate. Students not from GMIT program have to apply with motivation letter to the teachers. Number of participants is limited.
**Places for exchange-students? (Yes, number/No):**
Yes, 5.

## A330A0251: Internationalisation of the Firm, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Sami Saarenketo, Anisur Faroque, Juha Väätänen, Igor Laine, Iustin Vadana, Maria Uzhegova

**Note:**
Interchangeable with CS10A0551 International Business Methods and A330A0250 Internationalization of the Firm and Global Marketing. Course will be lectured twice a year, in periods 2 and 3.
**Year:**
M.Sc. (Tech.) 1, M.Sc. (Econ. & Bus. Adm.) 1
**Period:**
2, 3
**Teaching Language:**
English
**Teacher(s) in Charge:**
Post-doctoral researcher, D.Sc. (Econ. & Bus. Adm.) Igor Laine (2nd period 2017)
Junior researcher, D.Sc. (Econ. & Bus. Adm.) Anisur Faroque (3rd period 2018)
Professor, D.Sc. (Econ. & Bus. Adm.)) Sami Saarenketo
Professor, D.Sc. (Tech.) Juha Väätänen
**Aims:**
Learning outcomes: After completing the course the student will understand the processes of firm internationalization and global marketing. The learning outcomes of the course are the following:
1. To recognize the characteristics of the international market environment and of international business
2. To recognize the dimensions and drivers of market globalization
3. To assess and criticize the essential theories and frameworks of firm internationalization
4. To evaluate the ways in which international trade and investments affect world markets
5. To evaluate the risks and opportunities in global markets
6. To evaluate how to conduct sustainable international business
7. To analyze the key management decisions connected with the internationalization of the firm and global marketing: Whether to internationalize, deciding which markets to enter, deciding how to enter the foreign market
8. To be able to collaborate in cross-cultural teams
9. To create and deliver a group presentation focusing on the internationalization decisions of a given company.
**Contents:**
Must know: International trade and investments, Drivers of globalization, Chain of strategic decisions related to internationalization of the firm, internationalization motives and barriers, Risks assessment in international markets, Internationalization theories (Uppsala model, Network approach, Born Global), international market selection process, factors influencing entry mode choice, characteristics of various entry modes (export modes,

intermediate entry modes, hierarchical modes);
Should know: Global business relations and trade agreements, Concept of value chain in internationalization, comparison of SMEs and LSEs in internationalization and global marketing, environmental analysis in deciding which market to enter (political, economic, sociocultural, and technological environment);
Additional knowledge: Principles of transaction cost analysis.
**Teaching Methods:**
21 h lectures, 12 h exercises, 30 h written assignments, 30 h written report, 32 h course literature, 35 h self study and exam preparation. Total 160 h.
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0 - 5. Examination 50 %, exercises 30 %, research report 20 %. Each of the components has to be passed acceptably.
**Course Materials:**
1) Hollensen, S. (2017) Global Marketing, 7th edition, Pearson Education (older editions apply as well)
2) Cavusgil S.T., Knight G., Reisenberger J. (2017) – International Business: The New Realities, 4th edition, Pearson Education (older editions apply as well)
Additional materials will be announced on lectures. Additional reading and material assigned in class.
**Prerequisites:**
Sufficient prior business studies and basic knowledge of international marketing required. Due to the teaching methods, the amount of participants may be limited to 75 participants. In this case the priority would be given to the students of the School of Business and Management
**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 75
**Places for exchange-students? (Yes, number/No):**
Yes
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.
**Related to:**
to sustainability

## CS10A0120: Introduction to M.Sc. Studies in Industrial Engineering and Management, 1 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Marja Talikka, Leonid Chechurin, Ville Ojanen

**Year:**
M.Sc. (Tech.) 1
**Period:**
1-4
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Ville Ojanen
Professori Leonid Chechurin
Information Specialist, M.Sc. (Tech.) Marja Talikka
**Aims:**

The course provides the student with basic knowledge of studying at Lappeenranta University of Technology (LUT), Finland, in general and particularly in his/her school and degree programme. The course is aimed to help students to plan their studies at LUT and follow the progress of their studies with the help of a individual study plan.
Students recognize their own learning strategy and learn about information retrieval and the information sources available at LUT for courses and studying by using the Academic Library's services, collections and databases.
**Contents:**
The Orientation Days activities. Practical study-related information. Degree requirements. Planning of Master's studies.
Preparation of the individual study plan. Monitoring the progess of studies with the Academic Director and Student Affairs Secretary.
The Academic Library collections and databases.
**Teaching Methods:**
Participation in the Orientation Days. Planning the individual study plan.
Library introduction lectures and assignments on information retrieval and library databases on Moodle (Period 1).
Study programme meetings with the Academic Director and Study Councellor (Periods 1-4).
Assignments: individual study plan, library assignments. Independent study. Total 26 h.
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
Pass/Fail (assignments, active participation in study programme meetings)
**Course Materials:**
Materials will be announced during the course.
**Places for exchange-students? (Yes, number/No):**
No
**Places for Open University Students?(Yes, number/No):**
No

## CS30A1376: Product Development, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Andrzej Kraslawski

**Year:**
M.Sc. (Tech) 1
**Period:**
1-2
**Teaching Language:**
English
**Teacher(s) in Charge:**
Professor, Ph.D. Andrzej Kraslawski
**Aims:**
After fulfilling all requirements of the course, the students will be able to: 1. Understand the concept of new product development 2. Recognise the phases of new product development 3. Work in a team during product development 4. Apply the basic methods of product development.
**Contents:**
The key topics of the course are: 1. Major Phases of New Product Development, 2. Engineering Concept Development and Testing (design for manufacturability, user-centred engineering, visualisation of design, robust

design), 3. Integration of Technical Design and Business Analysis, 4. Intellectual Property in New Product Development, 5. Project Management, 6. Introducing a New Product to the Market

**Teaching Methods:**

The course is organised as a combination of regular lectures and interactive problem-solving sessions and project work. The classroom problem-solving sessions will be based on team-work in groups of 3-5 students. The 3-4 projects will be carried out in groups of 3-4 students independently and will result in the preparation of the project report. Classroom teaching and problem-solving sessions 36 hours. Project work 94 hours. Period 1. in-class activities (lectures, problem solving), period 2. out-of-class activities (project work). Total workload 130 hours.
Lectures, in-class activity, period 1.
Project work, out-of-class activity period 2.
Project work 94 hours.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Evaluation: solutions created in the classroom problem-solving sessions 40%, project reports 40%, written exam 20%. Attendance requirement: 90% of classroom sessions.

**Course Materials:**

Course slides
K. Ulrich, S. Eppinger: Product Design and Development, McGraw-Hill, 2012

**Prerequisites:**

Basic understanding of management. Basic knowledge of engineering disciplines.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 60

**Places for exchange-students? (Yes, number/No):**

Yes, 30

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS10A0863: Research Methods for Master Students, 6 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Roman Teplov, Daria Podmetina, Ekaterina Albats

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher, D.Sc. (Tech.) Daria Podmetina
PhD Student Ekaterina Albats
PhD Student Roman Teplov

Person in Charge: Post-Doctoral Researcher, D.Sc. (Tech.) Daria Podmetina

**Aims:**

The course aims to provide methodological support and clear guidelines to master students on how to conduct the research in management and how to report its results. In the end of the course, students should be able to find

and critically analyze empirical literature; to formulate clear research questions and research design; to collect and analyze qualitative and quantitative data; to interpret and report the results of the research.
**Contents:**
The course includes following topics: the nature of business and management research; formulating and clarifying the research topic; reviewing the literature; understanding research philosophies and approaches; formulating the research design; research ethics; collecting primary data and using secondary data; analyzing quantitative and qualitative data; writing project report and presenting the results. The course also has several in-class and home individual and group assignments targeted at developing the skills in conducting research and writing high quality master thesis.
**Teaching Methods:**
Lectures 36 h, exercises 6 h, research report and presentation 35 h, written assignments 25 h, course literature 30 h, self-study and exam preparation 25 h. Total 157 h. Moodle is used in this course.
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0-5. Based on written exam in the end of the course (40 %), research project report and its presentation (40%), home written assignments (master thesis analysis, article analysis, cases) and active participation during lectures (20%).
**Course Materials:**
Course book: Saunders, M, Lewis, P. and Thornhill, A. (2009). Research methods for business students, 5th ed., FT /Prentice Hall. Additional materials will be announced on the lectures.
**Prerequisites:**
The course is targeted to the students of Global Management of Innovation and Technology (GMIT) master program, but other students can also participate. Students not from GMIT program have to apply with motivation letter to the teachers. Number of participants is limited.
**Places for exchange-students? (Yes, number/No):**
No
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS34A0401: Strategic Entrepreneurship in an Age of Uncertainty, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Justyna Dabrowska, Ekaterina Albats, Marko Torkkeli

**Year:**
M.Sc. (Tech.) 1
**Period:**
1
**Teaching Language:**
English
**Teacher(s) in Charge:**
Professor, D.Sc. (Tech.) Marko Torkkeli
**Aims:**
Managing in a knowledge-based economy, Managing by Core Competences, Knowledge intensive firms, Uncertainty. Are they the latest buzz words or another passing managerial fad? Old wine in new bottles? Or perhaps, just perhaps, a fundamental means of survival and success for modern day corporations? Given the amount of effort that has been devoted to the topic by both academics and practitioners, it appears worth taking a

deep and dispassionate look at the role of entrepreneurial thinking in sustained competitive advantage. The goal is to learn as you go and effectively convert assumptions to knowledge at a low cost. During the course students learn to develop and test a business idea following the discovery driven planning steps as well as using the uncertainty management tools of Attribute Mapping, Supply Chain Analysis, Differentiation, Quizzing and Market-Busters. The course does not teach business plan writing but rather focuses on opportunity recognition and feasibility assessment. Moreover, it adds the elements of lean and guerilla marketing as well as social entrepreneurship as possible avenues in dealing with entrepreneurial challenges.
**Contents:**
During the course students learn to develop and test a business idea following the feasibility analysis, discovery driven planning steps as well as using the uncertainty
management tools of Attribute Mapping, Supply Chain Analysis, Differentiation, Quizzing and Market-Busters. The course does not teach business plan writing but rather focuses on opportunity recognition and feasibility assessment. Moreover, it adds the elements of lean and guerilla marketing as well as social entrepreneurship as possible avenues in dealing with entrepreneurial challenges.

Entrepreneurial thinking, uncertainty management, strategic entrepreneurship,
discovery-driven planning.
**Teaching Methods:**
Lectures 20 h, Independent study 73 h, seminar work writing 63 h, 1. period. Total 156 h.
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0 - 5. Based on assignment and in-class work, participation in the lectures required.
**Course Materials:**
Lectures and additional reading provided in the class. Book: McGrath Rita and MacMillan Ian, (2000). The Entrepreneurial Mindset. Harvard Business School Press.; McGrath Rita and MacMillan Ian, (2005). MarketBusters: 40 strategic moves that drive exceptional business growth. Harvard Business Press.
**Places for exchange-students? (Yes, number/No):**
Yes, 15
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS30A1341: Strategic Technology and Innovation Management, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ville Ojanen, Kalle Elfvengren

**Note:**
Will replace the previous 8 ECTS cr course
**Year:**
M.Sc. (Tech.) 1
**Period:**
3-4
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Ville Ojanen
**Aims:**

Student can 1. design and analyze technology and innovation strategy of a company, 2. apply different tools and frameworks of technology management, 3. Develop and plan alternative progress routes for managing technology, innovations, as well as product and service portfolios.

**Contents:**

Core material: Innovation as a core business process. Innovative organisation. Development of technology and innovation strategy. Innovation networks. Decision-making in technological and market uncertainty. Creation of new products and services. New technology-based ventures. Innovation performance and learning. Methods of technology management.

**Teaching Methods:**

Lectures and exercises 12 h, 3rd period. Lectures and exercises 10 h, 4th period. Seminars 12 h, 4 period. Preparation for lectures and exercises 12 h. Seminar work and other assignments 110 h. Total 156 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. No exam. Seminar works and other written reports and presentations 100%.

**Course Materials:**

Joe Tidd and John Bessant. Managing Innovation – Integrating Technological, Market and Organizational Change, 4th ed. 2009, or newer. Lecture notes and other material announced in the beginning of the course.

**Prerequisites:**

Recommended: CS30A0952 Innovaatio- ja teknologiajohtamisen peruskurssi (Finnish course). Recommended: B. Sc. in Industrial Engineering and Management or equivalent basic knowlege of innovation and technology management.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 50, priority to GMIT students.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

## TuDGMITSpec: Tuta GMIT, Specialisation Studies, 58 cp

**Validity:** 01.08.2016 -

**Form of study:**

**Type:** Study module

**Unit:** LUT School of Business and Management

No course descriptions.

*Obligatory specialisation studies 42 ECTS cr*

### CS30A1641: Inventive Product Design and Advanced TRIZ, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Leonid Chechurin

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, Ph.D. Leonid Chechurin

**Aims:**

After having completed the course, student is to know and able to apply instruments for product/process inventive design. The course helps to recognize the role, place and institutions of invention in innovation process/business. It contains basics on patenting, patent search and analysis, including modern approaches (big data, semantic etc). The course presents conceptual design context and its tools (Quality Function Deployment, Kano model, Decision making tools etc). It reviews modern design tools: Axiomatic Design, Design For X (Manufacturing, Robustness, Assembly, Environment, etc) and focuses on the role and main instruments of TRIZ (Ideal Final Result, Contradictions, SuFiled, Trends of Engineering System Evolution). We learn how to model an engineering system/product by Function framework, perform Function Model analysis transformation, Trimming (system reduction), Function-Oriented search, build Fault tree. About 20 case studies and 100 examples of inventive designs are presented.

**Contents:**

Introduction Optimization and Invention. Design roadmaps. 1. Information search and analysis: Patent and Scientific paper data bases. Search by keywords and classification codes. Function oriented search. Similarity: bibliographic, semantic. Technology landscapes. Subject-Object-Action framework. ArrowSmith approach. 2. Function based analysis: Ontologies of system description. Function based modeling. Subject-Object-Function framework. Function analysis. 3. Design evaluation: Axiomatic Design. DFx: design for manufacturability and assembly, design for robustness, design for environment, etc. TRIZ's design ideality concept. Trends of engineering system evolution as evaluation tool. Case studies and examples, Hands on. 4. Design modification: Function-based design improvement: trimming, contradiction elimination. Substance-Field. Standards for SuField model transformations. Case Studies, examples, Hands on. 5. Algorithm: Inventive design roadmap. Context of inventive design in industrial environment: market analysis tools (QFD, Kano, etc.), integration to research management tools, decision making tools. Case studies. Conclusion.

**Teaching Methods:**

Lectures 28 h, exercises 28 h, team work 38 h, reading 49 h, exam 13 h. Total workload 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Final grade 0 - 5. Test 30% + Report on project (Assignment) 50% + Personal reading 20%.

**Course Materials:**

Handouts of lecture notes, internet resources in open access (given).

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### CS30A1661: Open Innovation, 6 cp

**Validity:** 01.08.2013 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Ekaterina Albats, Antero Kutvonen, Daria Podmetina, Justyna Dabrowska

**Year:**

M.Sc. (Tech.) 2, M.Sc. (Econ. & Bus. Adm.) 2

**Period:**

Periods 1-2, Periods 3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Researcher, D.Sc. (Tech.) Antero Kutvonen

**Aims:**

Student
1. can explain the concept of open innovation through both theory and examples (to e.g. a company executive)
2. identifies open innovation activities in real life companies and explain the motives for engaging in them and the mechanisms through which they create value for the company
3. can distinguish between modes of inbound and outbound open innovation
4. can analyze the relation between a company's strategic choices and application of open innovation
5. attains a basic familiarity with the scientific literature on the theme and the ability to view open innovation in the context of other innovation management theories.

**Contents:**

Must know: The fundamental definitions and concept of open innovation. Modes of inbound open innovation, i.e. external acquisition of knowledge, and outbound open innovation, i.e. external exploitation of knowledge. Difference between closed and open innovation in managing technology. Identifying open innovation activities in real life firms. Monetary and strategic motives for engaging in open innovation.
Should know: Process models of inbound and outbound open innovation. The role and importance of the individual process phases. The relation between corporate strategy, technology strategy and open innovation activities. Most common examples of firms used to explain open innovation. Varying topics from state-of-the-art open innovation research, depending on guest lecturer. Basics of IPR management in open innovation.
Nice to know: Development of the open innovation concept on the basis of prior innovation management theories. Knowledge of the main scientific literature surrounding open innovation. Theoretical determinants of open innovation.

**Teaching Methods:**

Lectures and guest speakers 35 h as intensive teaching. Small group assignments during lectures. Group exams (or substituting them with summaries of scientific articles, 24 h) on three of the intensive days, preparing for exams 24 h. Independent study 72 h. Total 155 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Continuous evaluation based on small group exams (80%) and participation in lectures (20%). Possibility to substitute group exams with literary work (summaries of scientific articles) in case of absence.

**Course Materials:**

The course book and reading material will be announced at the first lecture.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 40 students, prioritized based on motivation letter submitted during registratio

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

Yes, 0-5 places – admittance based on motivation letter

### CS90A0060: Master's Thesis, 30 cp

**Validity:** 01.08.2008 -
**Form of study:** Basic studies
**Type:** Master's Thesis
**Unit:** LUT School of Business and Management
**Teachers:** Timo Pirttilä

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Timo Pirttilä
Other teachers: Professors and Associate Professors of Industrial Engineering and Management

**Aims:**

In their Master’s thesis, students demonstrate their knowledge of a topic of scientific and societal importance in a specific professional area. The student
must demonstrate the ability to carry out the project independently and following a plan. The thesis must be organised coherently, the presentation
academic and the language revised.

**Contents:**

The Master’s thesis is the final project of the degree of Master of Science (Technology). Usually it involves a development project commissioned by a

company and takes about six months. The work entails working on a development project related to industrial management, preparing a report in the form of a
thesis, and presenting the work in a way that the professor of the major subject requires.
Topic of the master's thesis has to be confirmed as soon as the topic has been decided with the supervisor. Use form 1A in UNI-portal.

**Teaching Methods:**

Development project and related report, presentation of the work (professor of the major subject defines the way), maturity test (usually on the contents of the thesis).

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Master’s thesis 100 %.

**Prerequisites:**

B.Sc. (Tech.) degree (not required of students admitted directly into a Master’s programme), complementary studies (for students admitted directly into
a Master’s programme).

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

NO

**Related to:**

to sustainability

*Elective specialisation studies min. 16 ECTS cr*

**CS10A0270: Economic Challenges in Russia, 3 cp**

**Validity:** 01.08.2014 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Pekka Sutela

**Year:**

M.Sc. (Tech.) 1

**Period:**

2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Soc.Sc. Pekka Sutela

**Aims:**

After the course, students will be able to follow and understand Russia's economic development, understand various different political and economic options of countries, draw conclusions on the political and economic future of Russia.

**Contents:**

The course provides an up-to-date introduction to the political economy of Russia since 1991. It first outlines the inheritance left by the Soviet Union and then deals with the Russian economics of transition in the 1990s. The political economy of the Putin years since 2000 are discussed in some detail, including issues of economic policy, financial and fiscal issues, the role of energy and the growth experience of the 2000s. The path of the economy in the Great Depression is also discussed, and attention is paid to Putin's current third term as President. Finally, the economic and political economy challenges ahead are outlined, including demography, deceleration of growth, the role of Russia in the global economy and issues of economic relations with the neighbouring countries.

**Teaching Methods:**

Lectures 24 h, course reading package 22 h, exam preparation 22 h, total 68 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, Exam 100%

**Course Materials:**

Sutela P. (2012) The Political Economy of Putin's Russia. Routledge. EBRD Transition Report, newest version. Available on EBRD website. Gaddy, C. G. and Ickes, B. 2013. Bear Traps on Russia's road to Modernization. Routledge, New York, USA.

**Prerequisites:**

Sufficient prior business studies required.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS10A0760: Business in Russia, 6 cp

**Validity:** 01.08.2012 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Daria Podmetina, Juha Väätänen

**Year:**

M.Sc. (Tech.) 1

**Period:**

3

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Juha Väätänen
Post Doctoral Researcher, D.Sc. (Tech) Daria Podmetina

**Aims:**

Student is able to 1. analyze consumer markets, 2. define the special characteristics of Russian business, 3. assess competitiveness of industrial sectors and enterprises, 4. assess foreign direct investment projects, 5. understand innovation process and innovation strategy on individual, company and country levels, 6. recognize Russia's competitive advantages and disadvantages, 7. explain the methods of increasing competitiveness and productivity on national, industrial and company level.

**Contents:**

Consumer markets. Living standard analysis. Russian enterprise structures. Industrial and service sectors. Company innovation strategies. Entrepreneurship and new enterprises. Marketing practices. Trade, foreign direct investments and e-commerce. Russia's competitiveness and future trends.

**Teaching Methods:**

Lectures 21 h, seminar work and presentation 60 h, course literature 45 h, self study and exam preparation 30 h. Total 156 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Exam 60 %, written report 40 %. Each of the components has to be passed acceptably.

**Course Materials:**

The World Bank in the Russian Federation. Policy Uncertainty Clouds Medium-Term Prospects. Latest available version. Diversifying Russia. Harnessing regional diversity. EBRD. Latest available version. Additional material will be announced on lectures

**Prerequisites:**

Recommended: CS10A0270 Economic Challenges in Russia. Other sufficient prior business studies are encouraged.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS10A0885: Research Project in Industrial Management, 1 - 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Leonid Chechurin, Ekaterina Albats, Ville Ojanen, Daria Podmetina, Juha Väätänen

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

1-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor D.Sc. (Tech.) Juha Väätänen
Associate Professor D.Sc. (Tech.) Ville Ojanen
Professor Leonid Chechurin
Associate Professor D.Sc. (Tech.) Daria Podmetina

**Aims:**

Student learns to conduct independent research work in Industrial Engineering and Management in a specialized area.

**Contents:**

A specific individual research project which is planned together with the supervisor and consists mainly of laboratory work, literature work and report writing. The course may contain lectures and seminars.

**Teaching Methods:**

Participation in the work of the research group and the research report, self-study totaling 26-156 hours.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5

**Course Materials:**

Literature related to the project.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

**Further information:**

The course is mainly targeted to Global Management of Innovation and Technology (GMIT) Master Programme students. The students register for the course by contacting the supervisor.

### CS30A1372: Creative Design and Problem Solving, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Andrzej Kraslawski

**Year:**

M.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, Ph.D. Andrzej Kraslawski

**Aims:**

Learning outcomes: After fulfilling all requirements of the course, the students will be able to: 1. Understand the principles of creative problem solving 2. Know the basic methods of creative design 3. Work in team during the design process 4. Apply methods of creative design to products, processes, services and business methods

**Contents:**

The major subjects of the course are: Major Steps in Problem Solving Types of Problems Types of Design Concept of Creativity Survey of Intuitive and Structured Methods of Creativity Enhancement Types of Brainstorming Check lists Morphological analysis Synectics Case-based Reasoning Graphical Methods Evaluation of Ideas

**Teaching Methods:**

The course is organised as a combination of regular lectures and interactive problem-solving sessions and project works. The in-class problem-solving sessions will be based on the team work realised by the groups of 3-5 students. The 3-4 project works will be realised by the groups of 3-4 students during the out-of-class activities and it will be finished with the preparation of the project report. In-class teaching and problem-solving sessions 42 h, project works 88 h. Total workload 130 h.

Lectures, in class activity, period 1.
Project work, out-of - class activity, period 2.
Project work 88 hours

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Final grade 0-5. Evaluation: Generated solutions of the in class problems 40 %, project reports 30 %, written exam 30%. Obligatory presence during 90% of in-class activities.

**Course Materials:**

Course slides.

Tony Proctor
Creative problem solving for managers
Routledge; 3rd edition, 2009

H. Scott Fogler and Steven E. LeBlanc
Strategies for Creative Problem Solving
Prentice Hall, 3rd edition , 2013

David Silverstein, Philip Samuel, Neil DeCarlo
The Innovator's Toolkit: 50+ Techniques for Predictable and Sustainable Organic Growth

Wiley, 2009

Alexander Osterwalder and Yves Pigneur
Business Model Generation
Osterwalder and Pigneur, 2010

**Prerequisites:**

Basic courses of management. Basic knowledge of engineering disciplines (e.g. process or mechanical engineering).

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 90

**Places for exchange-students? (Yes, number/No):**

Yes, 35

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS30A1391: Systems Engineering, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Andrzej Kraslawski

**Year:**

M.Sc. (Tech) 2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, Ph.D. Andrzej Kraslawski

**Aims:**

After fulfilling all of the requirements of the course, the students will be able to: 1. Understand the basic concepts of systems engineering 2. Apply the basic methods of systems analysis 3. Work in a team during systems design.

**Contents:**

The key topics of the course are: the concept of system, developing system requirements, the index of performance, system development and integration, system modelling, multi-criteria decision-making, ranking the alternatives.

**Teaching Methods:**

The course is organised as a combination of regular lectures and interactive problem-solving sessions and project work. The classroom problem-solving sessions will be based on team work in groups of 3-5 students. The 2-3 projects will be carried out in groups of 3-4 students independently and will result in the preparation of a project report. Classroom teaching and problem-solving sessions 30 hours. Project work 100 hours. Period 3. in-class activities (lectures, problem solving), period 4. out-of-class activities (project work). Total workload 130 hours.
Lectures, in-class  30 h, period 3. Project work, out-of class, 100 h, period 4.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Evaluation: solutions generated in classroom sessions 30%, project reports 40%, written exam 30%. Obligatory presence during 80% of in-class activities.

**Course Materials:**

Course slides.
Blanchard, B. S., Fabrycky, W. J.,
Systems Engineering and Analysis, Pearson, 2014

Liu Dahai
Systems Engineering, CRC Press, 2016

Alexander I., Beus-Dukic L.
Discovering Requirements, Wiley, 2009

Gibson J., Scherer W., Gibson W.
How to Do Systems Analysis, Wiley, 2007

Martin J.
Systems Engineering Guidebook, CRC, 1996

**Prerequisites:**

Basic courses on management.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 60

**Places for exchange-students? (Yes, number/No):**

Yes, 30

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS30A1602: Case Course in Strategy Consulting, 6 cp

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Samuli Kortelainen, Nina Tura

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher, D.Sc. (Tech.) Samuli Kortelainen
Doctoral Student, M.Sc. (Tech.) Nina Tura

**Aims:**

Student 1. can apply frameworks and tools of company strategy analysis in the context of strategic decision making 2. has the capability to assess and make conclusions about the strategic position of the company 3. can compose and produce company strategies and present them 4. has the capability and experience to work in the team and perform in English in the strategy context.

**Contents:**

Application of analysis methods and frames of reference. Strategic decisionmaking. Development of strategic thinking, problem-solving skills, group work and presentation skills through case exercises. The course excercises includes case solving in teams and Moodle exercises of analysis methods. In addition, the course includes four graded case exercises to be prepared and presented in teams. Local qualification round of the T.I.M.E.S. case competition (Tournament in Management and Engineering Skills) will be organized separately by Kaplaaki ry.

**Teaching Methods:**

The course requires active participation in all sessions. The course and presentations will be held in English. Lectures 6 h, Excercises 12 h, Case presentations (excercises) 12 h, Moodle exercises, case solving and preparation for excercises 90 h. Total 160 h. Moodle is used in this course.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Four presented cases will be graded 0 - 5. Case presentation 100 %. The final course grade will be based on the average of the case grades.

**Course Materials:**

Material given during the lecture and exercises.

### CS30A1671: Service Innovation and Management, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ville Ojanen, Kalle Elfvengren

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Associate Professor, D.Sc. (Tech.) Ville Ojanen

**Aims:**

Student can
1. recognize and categorize the variety of services and service firms in modern industrial environment as well as understand their influence in management of industrial innovations
2. identify the characteristics of services and evaluate the similarities, differences and links between services and physical products
3. define the dimensions of service innovations
4. explain the processes of new service development
5. summarize the main managerial challenges in service innovation management
6. select and apply the suitable frameworks, tools and methods, to overcome some typical real-world challenges in service innovation management

**Contents:**

Typologies of service firms. Characteristics of services. Product-service systems in manufacturing industry. Knowledge-intensive business services. New service development process. Dimensions of service innovations. Productization of services. Supporting methods for service innovation management. Managerial challenges in service innovation management. Utilization of frameworks, methods and tools in service innovation management. Roles of different types of firms in service systems and networks. Value creation through services. Customer-centric service development.

**Teaching Methods:**

Lectures and exercises 20 h, 3rd period. Seminars 12 h, 4th period. Group assignments and project work 120 h. Total 152 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Written reports and seminars 100 %.

**Course Materials:**

Lecture notes. Other material, books and articles announced in the beginning of the course.

**Prerequisites:**

Recommended: B.Sc. on Industrial Engineering and Management, or equivalent knowledge

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 50

**Places for exchange-students? (Yes, number/No):**

Yes, 5

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

**CS30A7402: Software and Application Innovation, 6 cp**

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Mirva Hyypiä, Antti Herala, Jari Porras, Helinä Melkas

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Jari Porras
Professor, D.Sc. (Tech.) Helinä Melkas

**Aims:**

This course combines technology and technology management perspectives for cross-scientific approach in software and application innovation process. After completion of the course students have broader perspective on innovation process in some yearly changing technically focused area. Students know how to innovate new meaningful software solutions and applications based on some technology, and what is the technical and business feasibility of the solution in domestic and international markets.

**Contents:**

Innovation management, idea generation and opportunity identification process. (Open) business models and technology commercialization in global markets. Product and service development. Basics and use cases of the selected technology, user-centric design and privacy perspectives in software and application development. The course is related to sustainability.

**Teaching Methods:**

Lectures 14 h. Innovation exercise to be given during the lectures 45 h, practical work (documentation) 45 h, independent group work 44 h, presentations 8 h. Total 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Practical work 100 %.

**Course Materials:**

To be announced later.

**Places for exchange-students? (Yes, number/No):**

Ýes, 10-15

**Places for Open University Students?(Yes, number/No):**

No

**Related to:**

to sustainability

**CS35A0153: Product Lifecycle Management, 6 cp**

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Jorma Papinniemi

**Note:**

This course is aimed for the students of Master's Degree level.

**Year:**

M.Sc. (Tech.) 2

**Period:**

3

**Teaching Language:**

English

**Teacher(s) in Charge:**

Lecturer, M.Sc. (Tech.) Jorma Papinniemi

**Aims:**

Student can
1. define and explain the concepts related to product data management and product life cycle management
2. recognize the company's product processes and understands their interaction with the company's overall operations
3. compare PLM-/PDM systems' characteristics, technical features and managerial functions and is able to see their role in product development and business management.

**Contents:**

Different views on product and lifecycle management. Product architectures and modularity. Product information modeling and change management. Requirements information management & systems engineering. Configuration process and configurators. PLM systems and their functionalities: managing generic products, individual products, items and documents. PLM project and system implementation. PLM for sustainability. Demos of PLM systems. Furure PCM in various industries.

**Teaching Methods:**

Lectures 21 h, seminars 14 h, 3rd period, as intensive studies. Course assignment 55 h and exam 68 h, 3rd period. Total 158 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Exam 60 %, project assignment and seminar participation 40 %.

**Course Materials:**

Journal articles and lecture material. Sääksvuori-Immonen: Product Lifecycle Management, Springer 2008. Forza-Salvador: Product Information Management for Mass Customization, Palgrave Macmillan, 2007. (partly)

**Prerequisites:**

B.Sc. on Industrial Management, or equivalent knowledge.

**Places for exchange-students? (Yes, number/No):**

Yes, 10.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### A210A0702: New Venture Management, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Antero Tervonen

**Note:**

The course is an advanced level course, but it can also be placed in bachelor´s studies. Course enrollment via WebOodi by 12.9.2017. Course is carried out in cooperation with several courses of Mechanical Engineering and Electrical Engineering Degree Programmes. The number of participants is limited to 30 (own quotas for Business Administration students and Industrial Engineering and Management students; the final selection is made mainly based on success in studies).

**Year:**

B.Sc. (Tech.) 2-3, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Tech.) 1-2, M.Sc. (Econ. & Bus. Adm.) 1-2

**Period:**

1-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

University Lecturer, D.Sc. (Tech.) Antero Tervonen

**Aims:**

By the end of the course, students will be able to
- apply the skills and knowledge accumulated from previous courses into practice,
- plan and manage implementation of different business operations,
- manage and organize business as a whole and act as a manager,
- create various business and management documents and reports,
- communicate issues about the project with other firm members.

**Contents:**

Recruited business experts together with engineering experts (= mainly mechanical engineering students) form virtual firms (= small groups) with 10-20 individuals and develop elements of business activity around their product idea.
The entire staff of the firm is self-organized and takes care of the establishment of the virtual firm. Business experts formulate a business plan and financial plan in cooperation with engineering experts of the firm. The tasks of business experts also include planning of various business activities, implementing those activities and reporting: management, financial management, cost accounting, budgeting, finance, marketing, supply chain management and logistics in cooperation with product planning and manufacturing.
The board (= the teachers of different accompanied courses and a business mentor outside the university) supports firm operations. As the operations proceed (= during the academic year) several

board meetings (= steering meetings) will be arranged. The goal is that the firms will have a real prototype of their product idea ready by the end of the first year of operations.

**Teaching Methods:**

Board steering sessions (= introductory lectures) 2 h, 1st period. Board steering sessions 6 h and the board meetings 3 h, 2nd period. Board steering sessions 2 h and the board meetings 4 h, 3rd period. Board steering sessions 2 h and the board meetings 2 h, 4th period. Independent project work by the staff of the virtual firm (the staff mainly defines working schedules, practices and responsibilities by itself) 139 h, 1st-4th periods. Total workload 160 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Grade 0-5, evaluation 0-100 points; project work 80 % (includes internal activities of the virtual firm, different written assignments of the business experts and performance in board meetings), peer review by the members of the firm 20 %.

**Course Materials:**

Material of the steering occasions of the board (= lecture notes). Material sought by the staff of the virtual firm.

**Prerequisites:**

The basic studies of bachelor’s degree in Business Administration or bachelor’s degree in Industrial Engineering and Management

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 30, based on success in studies.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

**Related to:**

to sustainability

### A330A0060: Managing Customer Relationships and Business Networks, 6 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Hanna Salojärvi, Joona Keränen, Asta Salmi

**Note:**

New course. Will replace CS10A0152 International Business Networks, CS10A0151 Business Relationships and Networks and A330A0050 Customer Relationship Management.

**Year:**

M.Sc. (Econ. & Bus. Adm.) 1, M.Sc. (Tech.) 1

**Period:**

3

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Econ. & Bus. Adm.) Asta Salmi
Associate Professor, D. Sc. (Econ. & Bus. Adm.) Hanna Salojärvi

**Aims:**

After completing the course the students are familiar with the theories of relationship marketing and network management, related concepts and models. The course provides the participants tools for understanding business relationships and networks, the strategic behavior of firms in this environment, and the managerial capabilities involved. The strong theoretical basis is combined with current relationship and network management material and implications.

On successful completion of the course, students: 1. Know the key theoretical frameworks related to business relationships and networks, and understand the principles of relationship marketing theory 2. Are familiar with customer relationship management as an organization wide strategic approach to managing customer relationships, 3. Are able to critically analyze the customer base, evaluate performance of customer relationships, and apply various strategies for managing customer relationships, 4. Understand the drivers of customer value and are able to design sustainable customer value propositions. 5. Identify the challenges of cross-sectoral and cross-national networks, 6. Understand and are able to evaluate the features of eco-industrial and sustainable business networks, and sustainable supply chains, and contemporary challenges in managing them, 7. Have developed skills in teamwork, in active participation in discussions, in oral presentations, in writing reports, as well as in reflecting on and taking the responsibility for their own learning.

**Contents:**

The course focuses on the following main contents: Theoretical approaches to inter-organizational relationships and business networks. Strategic management of customer relationships, B2B marketing, customer value and value-based selling. Supplier relationships and sustainable supply chains. Challenges and management of cross-sectoral networks. Sustainable and eco-industrial networks and challenges of managing them.

**Teaching Methods:**

Lectures, assignments including reflection papers and learning diary, case studies. Active participation in class is required.
In class hours (34 hours): 26 hours of lectures and 8 hours of case study workshops.
Out-class hours: Preparation for lectures 10 h, individual reflection papers and learning diary 80 h, preparation for case studies 36 h. Total workload 160 hours.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Grade 0-5, evaluation 0-100 points, Learning diary (including reflection papers) 70 % and case studies 30 %.

**Course Materials:**

Assigned readings (collection of articles). Lecture slides.

**Prerequisites:**

Basic knowledge of marketing. A330A0300 Strategic Global Marketing Management recommended.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Number of students attending is limited to 120 students. Priority is given to LBM degree students.

**Places for exchange-students? (Yes, number/No):**

Yes, 1-5, if they fit within the total number of 120 students after accepting LBM degree students.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions

### CS30A7370SS: Simulation Modelling in Industrial Management, 3 cp

**Validity:** 01.06.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Kortelainen

**Note:**

The number of course attendants is limited to 20. The course teacher selects 20 students after the course registration is over.

**Year:**

M.Sc. 1-2

**LUT Summer School time:**

7.-11.8.2017

**LUT Winter School time:**

First week of January

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher Samuli Kortelainen, LUT

**Aims:**

Learning outcomes:

The amount of data available for decision makers is constantly increasing. The increase of data enables new opportunities for managers, but also creates a demand to develop systems that can generate this data into usable intelligence. Simulation techniques offer interesting option for managers to better understand and develop firm’s business processes.

The key simulation skills that the student has to possess after successful completion of the course:

- Understanding on what system and complexity theories mean, and what are their business implications
- Capability and design simulations model with a systematic process
- Understand the possibilities, but also restrictions, of simulation modelling as an analysis tool
- Practical simulations skills with the three most common simulation methods
  o System dynamics
  o Discrete event simulation
  o Agent based modelling
- Skill to use simulation models to conduct tests on system performance

**Contents:**

This course is designated to explore two critical aspects of simulation modelling to business management:
- The analysis and development of already existing processes
- The analysis and testing of new proposed process

First, the natural way to use simulation modelling is to model the firm's current operations. The goal in this kind of simulation is to understand and then develop firm's processes to perform better. As such, simulation offers an opportunity to support management of firm's operational processes. During the course, this methodology is used to simulate firm's manufacture processes, but also more abstract service processes.

The second way to utilize simulation is to model future processes. This enables testing the effect of a new innovation to a given process. This allows analysis on the true value of an innovation and thus supports management of innovations. This application area is the focus of later part of the course.

**Teaching Methods:**

The teaching is dominantly interactive workshop in small groups supported by in-class lectures. In addition there is a pre-course essay for the course, which has 3 questions. Expected length is 20 pages.

- In-class teaching 6 hours
- Workshop + learning diary at the end of each lecture day 24 hours
- Pre-course work 48 hours

Total workload 78 hours
Maximum course attendants is 20 persons. Final student selection is made by the teacher after the registration is over.

**Assessment:**

Final grade 0-5. Evaluation:
- essay 60 %
- learning diary 40 %

**Course Materials:**

Course slides to be distributed during the course.

**Prerequisites:**

- Previous studies in management are strongly suggested
- Skills that assist learning
  - o Basic Excel and coding skills
  - o Good skills in logical thinking
  - o Basic math skills
  - o Positive attitude

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, maximum course attendants is 20 persons. Final student selection is made by the teacher after the registration is over.

### A330A5000SS: International Marketing of High Technology Products and Innovations, 3 cp

**Validity:** 01.06.2012 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Sanjit Sengupta, Sanna-Katriina Asikainen

**Note:**

The course topics are related to sustainable development.

**Year:**

M.Sc. 2

**LUT Summer School time:**

24.-28.7.2017

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, LUT

**Aims:**

Learning outcomes:

- Distinguish the special characteristics of high technology marketing environment (like the type of innovation, market and technology uncertainties, network externalities) and assess external high technology environments (e.g. relating to competitive landscape, consumer behavior, markets) in global scale.
- Evaluate and justify marketing strategies in high technology environments.
- Make marketing decisions in high technology environments.

Course aims to provide a deep understanding of the functions of marketing regarding challenges and opportunities in high technology products and markets; assist the participants to understand the virtue and limitations of traditional marketing thinking and tools in emergent high technology markets.

**Contents:**

- Strategy and corporate culture in high tech firms.
- Partnerships and alliances.
- Marketing research in high tech markets.
- Understanding high tech customers.
- Product development and management issues in high tech markets.
- Pricing considerations in high tech markets.
- Advertising and promotion in high tech markets.

**Teaching Methods:**

- Lectures and in-class assignments 30 hours
- Preparing for lectures 25 hours
- Preparing for exam 25 hours

Total workload 80 hours.

**Assessment:**

Final grade 0-5. Evaluation 0-100 points:
- Exam 50 points
- In-class assignments 30 points
- Class participation 20 points

**Course Materials:**

- Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2010) Marketing of High-Technology Products and Innovations. Third Edition. Pearson Prentice Hall. Web site http://marketinghightech.net/
- Assigned reading.

**Prerequisites:**

For summer school students: previous studies in business recommended.

For MIMM degree students at LUT: Internationalization of the Firm and Global Marketing, Strategic Global Marketing Management, Technology and Innovation Management.

*Exchangeable courses*

**CS30A1684SS: Advanced Course in Strategic Management, 3 cp**

**Validity:** 01.06.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Kortelainen

**Note:**

**LUT students: the student who has completed the course CS30A1682 Advanced Course in Strategic Management can not include this course into the LUT degree.**

**Year:**

M.Sc. 1-2

**LUT Summer School time:**

31.7-4.8.2017

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher Samuli Kortelainen, LUT

**Aims:**

Learning outcomes.

Strategic management literature is a widely research topic, that has led to a wide and many times confusing and even contradictory literature. In order to fully understand the current state of literature, the lens needs to be first turned to the history of different strategic schools. Therefore, the course starts from the roots of strategy management and then builds a comprehensive view to the current status of strategic management literature.

After the successful completion of course the student has:

- Comprehensive picture of the current state of strategic management theory and understanding reasoning behind different strategic management theories
- Understanding on the limitations and restrictions in current strategic management theory and their practical implications
- Holistic view to current new themes linking strategic management theories to other industrial management disciplines

**Contents:**

**Main schools of strategic management**
The course begins on looking at the development history of main strategic management schools, where the goal is to identify similarities and differences between different literature streams.

**The challenges and criticism of current strategic management theories**
Although strategic management theories are widely applied, they are also subjected to wide range of criticism. The second part of lectures focuses on these critical aspects of strategic management.

**Current development paths of strategic management theory**
Third part focuses on the various detailed development steps in strategic management literature to counter or point critical points in original theories.

**Linking strategic management to other management theories**
There are multiple different management literature streams (e.g. marketing, supply-chain, and innovation) that also tackle strategic issues. The fourth part of lectures focuses on bridging these management theories.

**New entries to strategic management discussion**
The final part of lecture series focuses on raising themes in strategic management such as multi-sided markets, business models, and data analytics.

**Teaching Methods:**

Lectures 16 hours
In-class room exercises 10 hours
Essay summarizing critical strategic management articles, workload 24 hours
Preparing for the exam 16 hours; final exam executed on the final day of the course 12 hours

Total workload 78 hours

**Assessment:**

Final grade 0 – 5:

Exam 60%
Essay 40%

**Course Materials:**

Course slides and selected articles to be announced in the class.

**Prerequisites:**

- Successfully completed Bachelor or higher level studies in Industrial Management
- Good understanding on basic strategic management concepts
- Basic knowledge on other management topics (marketing, innovation management)

**CS30A1655: Advanced Course in Strategic Management, 6 cp**

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Kortelainen

**Note:**

The student who has completed the course CS30A1684 Advanced Course in Strategic Management can not include this course into the LUT degree.

**Year:**

M.Sc. (Tech) 2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher, D.Sc. (Tech.) Samuli Kortelainen

**Aims:**

Strategic management literature is a widely research topic, that has lead to a wide and many times confusing and even contradictory literature. In order to fully understand the current state of literature, the lens needs to be first turned to the history of different strategic schools. Therefore, the course starts from the roots of strategy management and then builds a comprehensive view to the current status of strategic management literature. After the successful completion of course the student has:
1. Comprehensive picture of the current state of strategic management theory o Understanding reasoning behind different strategic management theories
2. Understanding on the limitations and restrictions in current strategic management theory and their practical implications
3. Holistic view to current new themes linking strategic management theories to other industrial management disciplines

**Contents:**

1. Main schools of strategic management The course begins on looking at the development history of main strategic management schools, where the goal is to identify similarities and differences between different literature streams.
2. The challenges and criticism of current strategic management theories Although strategic management theories are widely applied, they are also subjected to wide range of criticism. The second part of lectures focuses on these critical aspects of strategic management.
3. Current development paths of strategic management theory Third part focuses on the various detailed development steps in strategic management literature to counter or point critical points in original theories.

**Teaching Methods:**

Lectures 18 h, in-class room exercises 10 h, seminarwork and presentation 50 h, preparation to exam 50 h. Total 128 h. Individual 24 h exam.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Assessment:**

0 - 5. Exam 50 %, exercise 50 %.

**Places for exchange-students? (Yes, number/No):**

Yes, 10

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS10A0875: Industrial Project Management, 3 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Olli-Pekka Hilmola, Daria Podmetina, Ekaterina Albats, Roman Teplov

**Year:**
M.Sc. (Tech.) 1-2
**Period:**
3
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Daria Podmetina
Professor, D.Sc. (Tech.) Olli-Pekka Hilmola
**Aims:**
This course provides an introduction the fundamental aspects of modern project management. In practical assignments students will learn, how to apply the project management skills. This course aims to:
• introduce the concepts and tools available to project managers for organizing, planning, and controlling projects (PERT, Gantt, critical path, critical chain and DSM matrixes).
• study the managerial, cultural, and social aspects of Project Management.
• discuss the importance of the organization’s strategy during the project selection.

• teach the critical role of work breakdown structures and networks in planning, scheduling, and estimating the status of projects.
• create an awareness of potential conflicts and scheduling problems that occur on projects.
• demonstrate how to reliably estimate the status of projects.
• demonstrate the MS Project, and DSM software for planning and scheduling projects.
management of multi-project environment and multitasking
• finance of technology development projects

**Contents:**
This course covers the fundamental concepts and applied techniques for cost effective management of both long-term development programs and short-term projects. The content deals with planning, scheduling, organizing, and controlling projects. The course uses cases from a wide variety of industries. Project management principles and methodology are provided with special focus on planning, controlling, and managing projects to successful completion. After successfully completing this course, the student will be able to:
• Identify the elements of the PM life cycle, including: Plan, Control, and Organize and Allocate Resources
• Understand PM processes
• Comprehend basic tools and techniques to plan, organize and manage a project
• Optimize results while managing the triple constraints
• Manage stakeholder communications
• Describe the principles of Team Leadership

**Teaching Methods:**
Lectures 14 h, computer exercises and case analysis 32 h (each group needs to analyze one real technology development project regarding its risks and present it in joint-seminar), individual work and seminar preparation 22 h, total 68 h. Moodle is used in this course.

**Examination in Examination schedule (Yes/No):**
No

**Examination in Moodle (Yes/No):**
No

**Examination in Exam (Yes/No):**
No

**Assessment:**
0-5, based on the report (70 %), and home assignments/group work during the course (30 %). Note, there will not be written exam in the end of the course

**Course Materials:**
Kerzner, Harold R. (2013). Project Management: A Systems Approach to Planning, Scheduling, and Controlling. Wiley, New Jersey. Eppinger, Steven D. & Tyson R. Browning (2012). Design Structure Matrix Methods and Applications. MIT press, Boston. Other course materials will be announced on the first lecture.

**Prerequisites:**
The course is targeted to the students of Global Management of Innovation and Technology (GMIT) master program, but other students can also participate. Students not from GMIT program have to apply with motivation letter to the teachers. Number of participants is limited.

**Places for exchange-students? (Yes, number/No):**
Yes, 5.

## A330A0251: Internationalisation of the Firm, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Sami Saarenketo, Anisur Faroque, Juha Väätänen, Igor Laine, Iustin Vadana, Maria Uzhegova

**Note:**
Interchangeable with CS10A0551 International Business Methods and A330A0250 Internationalization of the Firm and Global Marketing. Course will be lectured twice a year, in periods 2 and 3.

**Year:**
M.Sc. (Tech.) 1, M.Sc. (Econ. & Bus. Adm.) 1

**Period:**
2, 3
**Teaching Language:**
English
**Teacher(s) in Charge:**
Post-doctoral researcher, D.Sc. (Econ. & Bus. Adm.) Igor Laine (2nd period 2017)
Junior researcher, D.Sc. (Econ. & Bus. Adm.) Anisur Faroque (3rd period 2018)
Professor, D.Sc. (Econ. & Bus. Adm.)) Sami Saarenketo
Professor, D.Sc. (Tech.) Juha Väätänen
**Aims:**
Learning outcomes: After completing the course the student will understand the processes of firm internationalization and global marketing. The learning outcomes of the course are the following:
1. To recognize the characteristics of the international market environment and of international business
2. To recognize the dimensions and drivers of market globalization
3. To assess and criticize the essential theories and frameworks of firm internationalization
4. To evaluate the ways in which international trade and investments affect world markets
5. To evaluate the risks and opportunities in global markets
6. To evaluate how to conduct sustainable international business
7. To analyze the key management decisions connected with the internationalization of the firm and global marketing: Whether to internationalize, deciding which markets to enter, deciding how to enter the foreign market
8. To be able to collaborate in cross-cultural teams
9. To create and deliver a group presentation focusing on the internationalization decisions of a given company.
**Contents:**
Must know: International trade and investments, Drivers of globalization, Chain of strategic decisions related to internationalization of the firm, internationalization motives and barriers, Risks assessment in international markets, Internationalization theories (Uppsala model, Network approach, Born Global), international market selection process, factors influencing entry mode choice, characteristics of various entry modes (export modes, intermediate entry modes, hierarchical modes);
Should know: Global business relations and trade agreements, Concept of value chain in internationalization, comparison of SMEs and LSEs in internationalization and global marketing, environmental analysis in deciding which market to enter (political, economic, sociocultural, and technological environment);
Additional knowledge: Principles of transaction cost analysis.
**Teaching Methods:**
21 h lectures, 12 h exercises, 30 h written assignments, 30 h written report, 32 h course literature, 35 h self study and exam preparation. Total 160 h.
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0 - 5. Examination 50 %, exercises 30 %, research report 20 %. Each of the components has to be passed acceptably.
**Course Materials:**
1) Hollensen, S. (2017) Global Marketing, 7th edition, Pearson Education (older editions apply as well)
2) Cavusgil S.T., Knight G., Reisenberger J. (2017) – International Business: The New Realities, 4th edition, Pearson Education (older editions apply as well)
Additional materials will be announced on lectures. Additional reading and material assigned in class.
**Prerequisites:**
Sufficient prior business studies and basic knowledge of international marketing required. Due to the teaching methods, the amount of participants may be limited to 75 participants. In this case the priority would be given to the students of the School of Business and Management
**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 75
**Places for exchange-students? (Yes, number/No):**
Yes
**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.
**Related to:**
to sustainability

## CS30A1376: Product Development, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Andrzej Kraslawski

**Year:**
M.Sc. (Tech) 1
**Period:**
1-2
**Teaching Language:**
English
**Teacher(s) in Charge:**
Professor, Ph.D. Andrzej Kraslawski
**Aims:**
After fulfilling all requirements of the course, the students will be able to: 1. Understand the concept of new product development 2. Recognise the phases of new product development 3. Work in a team during product development 4. Apply the basic methods of product development.
**Contents:**
The key topics of the course are: 1. Major Phases of New Product Development, 2. Engineering Concept Development and Testing (design for manufacturability, user-centred engineering, visualisation of design, robust design), 3. Integration of Technical Design and Business Analysis, 4. Intellectual Property in New Product Development, 5. Project Management, 6. Introducing a New Product to the Market
**Teaching Methods:**
The course is organised as a combination of regular lectures and interactive problem-solving sessions and project work. The classroom problem-solving sessions will be based on team-work in groups of 3-5 students. The 3-4 projects will be carried out in groups of 3-4 students independently and will result in the preparation of the project report. Classroom teaching and problem-solving sessions 36 hours. Project work 94 hours. Period 1. in-class activities (lectures, problem solving), period 2. out-of-class activities (project work). Total workload 130 hours.
Lectures, in-class activity, period 1.
Project work, out-of-class activity period 2.
Project work 94 hours.
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0-5. Evaluation: solutions created in the classroom problem-solving sessions 40%, project reports 40%, written exam 20%. Attendance requirement: 90% of classroom sessions.
**Course Materials:**
Course slides
K. Ulrich, S. Eppinger: Product Design and Development, McGraw-Hill, 2012
**Prerequisites:**
Basic understanding of management. Basic knowledge of engineering disciplines.
**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 60
**Places for exchange-students? (Yes, number/No):**

Yes, 30
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS10A0863: Research Methods for Master Students, 6 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Roman Teplov, Daria Podmetina, Ekaterina Albats

**Year:**
M.Sc. (Tech.) 1-2
**Period:**
1-2
**Teaching Language:**
English
**Teacher(s) in Charge:**
Post-Doctoral Researcher, D.Sc. (Tech.) Daria Podmetina
PhD Student Ekaterina Albats
PhD Student Roman Teplov

Person in Charge: Post-Doctoral Researcher, D.Sc. (Tech.) Daria Podmetina
**Aims:**
The course aims to provide methodological support and clear guidelines to master students on how to conduct the research in management and how to report its results. In the end of the course, students should be able to find and critically analyze empirical literature; to formulate clear research questions and research design; to collect and analyze qualitative and quantitative data; to interpret and report the results of the research.
**Contents:**
The course includes following topics: the nature of business and management research; formulating and clarifying the research topic; reviewing the literature; understanding research philosophies and approaches; formulating the research design; research ethics; collecting primary data and using secondary data; analyzing quantitative and qualitative data; writing project report and presenting the results. The course also has several in-class and home individual and group assignments targeted at developing the skills in conducting research and writing high quality master thesis.
**Teaching Methods:**
Lectures 36 h, exercises 6 h, research report and presentation 35 h, written assignments 25 h, course literature 30 h, self-study and exam preparation 25 h. Total 157 h. Moodle is used in this course.
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0-5. Based on written exam in the end of the course (40 %), research project report and its presentation (40%), home written assignments (master thesis analysis, article analysis, cases) and active participation during lectures (20%).
**Course Materials:**
Course book: Saunders, M, Lewis, P. and Thornhill, A. (2009). Research methods for business students, 5th ed., FT /Prentice Hall. Additional materials will be announced on the lectures.
**Prerequisites:**

The course is targeted to the students of Global Management of Innovation and Technology (GMIT) master program, but other students can also participate. Students not from GMIT program have to apply with motivation letter to the teachers. Number of participants is limited.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS34A0401: Strategic Entrepreneurship in an Age of Uncertainty, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Justyna Dabrowska, Ekaterina Albats, Marko Torkkeli

**Year:**

M.Sc. (Tech.) 1

**Period:**

1

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Marko Torkkeli

**Aims:**

Managing in a knowledge-based economy, Managing by Core Competences, Knowledge intensive firms, Uncertainty. Are they the latest buzz words or another passing managerial fad? Old wine in new bottles? Or perhaps, just perhaps, a fundamental means of survival and success for modern day corporations? Given the amount of effort that has been devoted to the topic by both academics and practitioners, it appears worth taking a deep and dispassionate look at the role of entrepreneurial thinking in sustained competitive advantage. The goal is to learn as you go and effectively convert assumptions to knowledge at a low cost. During the course students learn to develop and test a business idea following the discovery driven planning steps as well as using the uncertainty management tools of Attribute Mapping, Supply Chain Analysis, Differentiation, Quizzing and Market-Busters. The course does not teach business plan writing but rather focuses on opportunity recognition and feasibility assessment. Moreover, it adds the elements of lean and guerilla marketing as well as social entrepreneurship as possible avenues in dealing with entrepreneurial challenges.

**Contents:**

During the course students learn to develop and test a business idea following the feasibility analysis, discovery driven planning steps as well as using the uncertainty
management tools of Attribute Mapping, Supply Chain Analysis, Differentiation, Quizzing and Market-Busters. The course does not teach business plan writing but rather focuses on opportunity recognition and feasibility assessment. Moreover, it adds the elements of lean and guerilla marketing as well as social entrepreneurship as possible avenues in dealing with entrepreneurial challenges.

Entrepreneurial thinking, uncertainty management, strategic entrepreneurship,
discovery-driven planning.

**Teaching Methods:**

Lectures 20 h, Independent study 73 h, seminar work writing 63 h, 1. period. Total 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Based on assignment and in-class work, participation in the lectures required.
**Course Materials:**
Lectures and additional reading provided in the class. Book: McGrath Rita and MacMillan Ian, (2000). The Entrepreneurial Mindset. Harvard Business School Press.; McGrath Rita and MacMillan Ian, (2005). MarketBusters: 40 strategic moves that drive exceptional business growth. Harvard Business Press.
**Places for exchange-students? (Yes, number/No):**
Yes, 15
**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.

## CS30A1341: Strategic Technology and Innovation Management, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ville Ojanen, Kalle Elfvengren

**Note:**
Will replace the previous 8 ECTS cr course
**Year:**
M.Sc. (Tech.) 1
**Period:**
3-4
**Teaching Language:**
English
**Teacher(s) in Charge:**
Associate Professor, D.Sc. (Tech.) Ville Ojanen
**Aims:**
Student can 1. design and analyze technology and innovation strategy of a company, 2. apply different tools and frameworks of technology management, 3. Develop and plan alternative progress routes for managing technology, innovations, as well as product and service portfolios.
**Contents:**
Core material: Innovation as a core business process. Innovative organisation. Development of technology and innovation strategy. Innovation networks. Decision-making in technological and market uncertainty. Creation of new products and services. New technology-based ventures. Innovation performance and learning. Methods of technology management.
**Teaching Methods:**
Lectures and exercises 12 h, 3rd period. Lectures and exercises 10 h, 4th period. Seminars 12 h, 4 period. Preparation for lectures and exercises 12 h. Seminar work and other assignments 110 h. Total 156 h.
**Suitability for doctoral studies (Yes/Leave empty):**
Yes
**Examination in Examination schedule (Yes/No):**
No
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Assessment:**
0-5. No exam. Seminar works and other written reports and presentations 100%.
**Course Materials:**
Joe Tidd and John Bessant. Managing Innovation – Integrating Technological, Market and Organizational Change, 4th ed. 2009, or newer. Lecture notes and other material announced in the beginning of the course.
**Prerequisites:**

Recommended: CS30A0952 Innovaatio- ja teknologiajohtamisen peruskurssi (Finnish course). Recommended: B. Sc. in Industrial Engineering and Management or equivalent basic knowlege of innovation and technology management.
**Limitation for students? (Yes, number, priorities/Leave empty):**
Yes, 50, priority to GMIT students.

**Places for Open University Students?(Yes, number/No):**
This course has 1-5 places for open university students. More information on the web site for open university instructions.
**Related to:**
to sustainability

## TuDGMITSpec2: Tuta GMIT, Specialisation Studies BCs, 58 cp

**Validity:** 01.08.2017 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Obligatory specialisation studies 42 ECTS cr*

### CS30A1641: Inventive Product Design and Advanced TRIZ, 6 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Leonid Chechurin

**Year:**
M.Sc. (Tech.) 1-2
**Period:**
4
**Teaching Language:**
English
**Teacher(s) in Charge:**
Professor, Ph.D. Leonid Chechurin
**Aims:**
After having completed the course, student is to know and able to apply instruments for product/process inventive design. The course helps to recognize the role, place and institutions of invention in innovation process/business. It contains basics on patenting, patent search and analysis, including modern approaches (big data, semantic etc). The course presents conceptual design context and its tools (Quality Function Deployment, Kano model, Decision making tools etc). It reviews modern design tools: Axiomatic Design, Design For X (Manufacturing, Robustness, Assembly, Environment, etc) and focuses on the role and main instruments of TRIZ (Ideal Final Result, Contradictions, SuFiled, Trends of Engineering System Evolution). We learn how to model an engineering system/product by Function framework, perform Function Model analysis transformation, Trimming (system reduction), Function-Oriented search, build Fault tree. About 20 case studies and 100 examples of inventive designs are presented.

**Contents:**

Introduction Optimization and Invention. Design roadmaps. 1. Information search and analysis: Patent and Scientific paper data bases. Search by keywords and classification codes. Function oriented search. Similarity: bibliographic, semantic. Technology landscapes. Subject-Object-Action framework. ArrowSmith approach. 2. Function based analysis: Ontologies of system description. Function based modeling. Subject-Object-Function framework. Function analysis. 3. Design evaluation: Axiomatic Design. DFx: design for manufacturability and assembly, design for robustness, design for environment, etc. TRIZ's design ideality concept. Trends of engineering system evolution as evaluation tool. Case studies and examples, Hands on. 4. Design modification: Function-based design improvement: trimming, contradiction elimination. Substance-Field. Standards for SuField model transformations. Case Studies, examples, Hands on. 5. Algorithm: Inventive design roadmap. Context of inventive design in industrial environment: market analysis tools (QFD, Kano, etc.), integration to research management tools, decision making tools. Case studies. Conclusion.

**Teaching Methods:**

Lectures 28 h, exercises 28 h, team work 38 h, reading 49 h, exam 13 h. Total workload 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Final grade 0 - 5. Test 30% + Report on project (Assignment) 50% + Personal reading 20%.

**Course Materials:**

Handouts of lecture notes, internet resources in open access (given).

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### CS30A1661: Open Innovation, 6 cp

**Validity:** 01.08.2013 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ekaterina Albats, Antero Kutvonen, Daria Podmetina, Justyna Dabrowska

**Year:**

M.Sc. (Tech.) 2, M.Sc. (Econ. & Bus. Adm.) 2

**Period:**

Periods 1-2, Periods 3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Researcher, D.Sc. (Tech.) Antero Kutvonen

**Aims:**

Student
1. can explain the concept of open innovation through both theory and examples (to e.g. a company executive)
2. identifies open innovation activities in real life companies and explain the motives for engaging in them and the mechanisms through which they create value for the company
3. can distinguish between modes of inbound and outbound open innovation
4. can analyze the relation between a company's strategic choices and application of open innovation
5. attains a basic familiarity with the scientific literature on the theme and the ability to view open innovation in the context of other innovation management theories.

**Contents:**

Must know: The fundamental definitions and concept of open innovation. Modes of inbound open innovation, i.e. external acquisition of knowledge, and outbound open innovation, i.e. external exploitation of knowledge. Difference between closed and open innovation in managing technology. Identifying open innovation activities in real life firms. Monetary and strategic motives for engaging in open innovation.
Should know: Process models of inbound and outbound open innovation. The role and importance of the individual process phases. The relation between corporate strategy, technology strategy and open innovation activities. Most common examples of firms used to explain open innovation. Varying topics from state-of-the-art open innovation research, depending on guest lecturer. Basics of IPR management in open innovation.
Nice to know: Development of the open innovation concept on the basis of prior innovation management theories. Knowledge of the main scientific literature surrounding open innovation. Theoretical determinants of open innovation.

**Teaching Methods:**

Lectures and guest speakers 35 h as intensive teaching. Small group assignments during lectures. Group exams (or substituting them with summaries of scientific articles, 24 h) on three of the intensive days, preparing for exams 24 h. Independent study 72 h. Total 155 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Continuous evaluation based on small group exams (80%) and participation in lectures (20%). Possibility to substitute group exams with literary work (summaries of scientific articles) in case of absence.

**Course Materials:**

The course book and reading material will be announced at the first lecture.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 40 students, prioritized based on motivation letter submitted during registratio

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

Yes, 0-5 places – admittance based on motivation letter

### CS90A0060: Master's Thesis, 30 cp

**Validity:** 01.08.2008 -
**Form of study:** Basic studies
**Type:** Master's Thesis
**Unit:** LUT School of Business and Management
**Teachers:** Timo Pirttilä

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Timo Pirttilä
Other teachers: Professors and Associate Professors of Industrial Engineering and Management

**Aims:**

In their Master’s thesis, students demonstrate their knowledge of a topic of scientific and societal importance in a specific professional area. The student
must demonstrate the ability to carry out the project independently and following a plan. The thesis must be organised coherently, the presentation
academic and the language revised.

**Contents:**

The Master’s thesis is the final project of the degree of Master of Science (Technology). Usually it involves a development project commissioned by a
company and takes about six months. The work entails working on a development project related to industrial management, preparing a report in the form of a
thesis, and presenting the work in a way that the professor of the major subject requires.
Topic of the master's thesis has to be confirmed as soon as the topic has been decided with the supervisor. Use form 1A in UNI-portal.

**Teaching Methods:**

Development project and related report, presentation of the work (professor of the major subject defines the way), maturity test (usually on the contents of the thesis).

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Master’s thesis 100 %.

**Prerequisites:**

B.Sc. (Tech.) degree (not required of students admitted directly into a Master’s programme), complementary studies (for students admitted directly into
a Master’s programme).

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

NO

**Related to:**

to sustainability

*Elective Specialisation studies min. 21 ECTS c*

**CS10A0270: Economic Challenges in Russia, 3 cp**

**Validity:** 01.08.2014 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Pekka Sutela

**Year:**

M.Sc. (Tech.) 1

**Period:**

2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Soc.Sc. Pekka Sutela

**Aims:**

After the course, students will be able to follow and understand Russia's economic development, understand various different political and economic options of countries, draw conclusions on the political and economic future of Russia.

**Contents:**

The course provides an up-to-date introduction to the political economy of Russia since 1991. It first outlines the inheritance left by the Soviet Union and then deals with the Russian economics of transition in the 1990s. The political economy of the Putin years since 2000 are discussed in some detail, including issues of economic policy, financial and fiscal issues, the role of energy and the growth experience of the 2000s. The path of the economy in the Great Depression is also discussed, and attention is paid to Putin's current third term as President. Finally, the economic and political economy challenges ahead are outlined, including demography, deceleration of growth, the role of Russia in the global economy and issues of economic relations with the neighbouring countries.

**Teaching Methods:**

Lectures 24 h, course reading package 22 h, exam preparation 22 h, total 68 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, Exam 100%

**Course Materials:**

Sutela P. (2012) The Political Economy of Putin's Russia. Routledge. EBRD Transition Report, newest version. Available on EBRD website. Gaddy, C. G. and Ickes, B. 2013. Bear Traps on Russia’s road to Modernization. Routledge, New York, USA.

**Prerequisites:**

Sufficient prior business studies required.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS10A0760: Business in Russia, 6 cp

**Validity:** 01.08.2012 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Daria Podmetina, Juha Väätänen

**Year:**

M.Sc. (Tech.) 1

**Period:**

3

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Juha Väätänen
Post Doctoral Researcher, D.Sc. (Tech) Daria Podmetina

**Aims:**

Student is able to 1. analyze consumer markets, 2. define the special characteristics of Russian business, 3. assess competitiveness of industrial sectors and enterprises, 4. assess foreign direct investment projects, 5. understand innovation process and innovation strategy on individual, company and country levels, 6. recognize Russia’s competitive advantages and disadvantages, 7. explain the methods of increasing competitiveness and productivity on national, industrial and company level.

**Contents:**

Consumer markets. Living standard analysis. Russian enterprise structures. Industrial and service sectors. Company innovation strategies. Entrepreneurship and new enterprises. Marketing practices. Trade, foreign direct investments and e-commerce. Russia’s competitiveness and future trends.

**Teaching Methods:**

Lectures 21 h, seminar work and presentation 60 h, course literature 45 h, self study and exam preparation 30 h. Total 156 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Exam 60 %, written report 40 %. Each of the components has to be passed acceptably.

**Course Materials:**

The World Bank in the Russian Federation. Policy Uncertainty Clouds Medium-Term Prospects. Latest available version. Diversifying Russia. Harnessing regional diversity. EBRD. Latest available version. Additional material will be announced on lectures

**Prerequisites:**

Recommended: CS10A0270 Economic Challenges in Russia. Other sufficient prior business studies are encouraged.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS10A0885: Research Project in Industrial Management, 1 - 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Leonid Chechurin, Ekaterina Albats, Ville Ojanen, Daria Podmetina, Juha Väätänen

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

1-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor D.Sc. (Tech.) Juha Väätänen
Associate Professor D.Sc. (Tech.) Ville Ojanen
Professor Leonid Chechurin
Associate Professor D.Sc. (Tech.) Daria Podmetina

**Aims:**

Student learns to conduct independent research work in Industrial Engineering and Management in a specialized area.

**Contents:**

A specific individual research project which is planned together with the supervisor and consists mainly of laboratory work, literature work and report writing. The course may contain lectures and seminars.

**Teaching Methods:**

Participation in the work of the research group and the research report, self-study totaling 26-156 hours.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5

**Course Materials:**

Literature related to the project.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

**Further information:**

The course is mainly targeted to Global Management of Innovation and Technology (GMIT) Master Programme students. The students register for the course by contacting the supervisor.

### CS30A1372: Creative Design and Problem Solving, 6 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Andrzej Kraslawski

**Year:**

M.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, Ph.D. Andrzej Kraslawski

**Aims:**

Learning outcomes: After fulfilling all requirements of the course, the students will be able to: 1. Understand the principles of creative problem solving 2. Know the basic methods of creative design 3. Work in team during the design process 4. Apply methods of creative design to products, processes, services and business methods

**Contents:**

The major subjects of the course are: Major Steps in Problem Solving Types of Problems Types of Design Concept of Creativity Survey of Intuitive and Structured Methods of Creativity Enhancement Types of Brainstorming Check lists Morphological analysis Synectics Case-based Reasoning Graphical Methods Evaluation of Ideas

**Teaching Methods:**

The course is organised as a combination of regular lectures and interactive problem-solving sessions and project works. The in-class problem-solving sessions will be based on the team work realised by the groups of 3-5 students. The 3-4 project works will be realised by the groups of 3-4 students during the out-of-class activities and it will be finished with the preparation of the project report. In-class teaching

and problem-solving sessions 42 h, project works 88 h. Total workload 130 h.

Lectures, in class activity, period 1.
Project work, out-of - class activity, period 2.
Project work 88 hours

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Final grade 0-5. Evaluation: Generated solutions of the in class problems 40 %, project reports 30 %, written exam 30%. Obligatory presence during 90% of in-class activities.

**Course Materials:**

Course slides.

Tony Proctor
Creative problem solving for managers
Routledge; 3rd edition, 2009

H. Scott Fogler and Steven E. LeBlanc
Strategies for Creative Problem Solving
Prentice Hall, 3rd edition , 2013

David Silverstein, Philip Samuel, Neil DeCarlo
The Innovator's Toolkit: 50+ Techniques for Predictable and Sustainable Organic Growth
Wiley, 2009

Alexander Osterwalder and Yves Pigneur
Business Model Generation
Osterwalder and Pigneur, 2010

**Prerequisites:**

Basic courses of management. Basic knowledge of engineering disciplines (e.g. process or mechanical engineering).

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 90

**Places for exchange-students? (Yes, number/No):**

Yes, 35

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS30A1391: Systems Engineering, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Andrzej Kraslawski

**Year:**

M.Sc. (Tech) 2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, Ph.D. Andrzej Kraslawski

**Aims:**

After fulfilling all of the requirements of the course, the students will be able to: 1. Understand the basic concepts of systems engineering 2. Apply the basic methods of systems analysis 3. Work in a team during systems design.

**Contents:**

The key topics of the course are: the concept of system, developing system requirements, the index of performance, system development and integration, system modelling, multi-criteria decision-making, ranking the alternatives.

**Teaching Methods:**

The course is organised as a combination of regular lectures and interactive problem-solving sessions and project work. The classroom problem-solving sessions will be based on team work in groups of 3-5 students. The 2-3 projects will be carried out in groups of 3-4 students independently and will result in the preparation of a project report. Classroom teaching and problem-solving sessions 30 hours. Project work 100 hours. Period 3. in-class activities (lectures, problem solving), period 4. out-of-class activities (project work). Total workload 130 hours.
Lectures, in-class 30 h, period 3. Project work, out-of class, 100 h, period 4.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Evaluation: solutions generated in classroom sessions 30%, project reports 40%, written exam 30%. Obligatory presence during 80% of in-class activities.

**Course Materials:**

Course slides.
Blanchard, B. S., Fabrycky, W. J.,
Systems Engineering and Analysis, Pearson, 2014

Liu Dahai
Systems Engineering, CRC Press, 2016

Alexander I., Beus-Dukic L.
Discovering Requirements, Wiley, 2009

Gibson J., Scherer W., Gibson W.
How to Do Systems Analysis, Wiley, 2007

Martin J.
Systems Engineering Guidebook, CRC, 1996

**Prerequisites:**

Basic courses on management.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 60

**Places for exchange-students? (Yes, number/No):**

Yes, 30

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CS30A1602: Case Course in Strategy Consulting, 6 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Kortelainen, Nina Tura

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher, D.Sc. (Tech.) Samuli Kortelainen
Doctoral Student, M.Sc. (Tech.) Nina Tura

**Aims:**

Student 1. can apply frameworks and tools of company strategy analysis in the context of strategic decision making 2. has the capability to assess and make conclusions about the strategic position of the company 3. can compose and produce company strategies and present them 4. has the capability and experience to work in the team and perform in English in the strategy context.

**Contents:**

Application of analysis methods and frames of reference. Strategic decisionmaking. Development of strategic thinking, problem-solving skills, group work and presentation skills through case exercises. The course excercises includes case solving in teams and Moodle exercises of analysis methods. In addition, the course includes four graded case exercises to be prepared and presented in teams. Local qualification round of the T.I.M.E.S. case competition (Tournament in Management and Engineering Skills) will be organized separately by Kaplaaki ry.

**Teaching Methods:**

The course requires active participation in all sessions. The course and presentations will be held in English. Lectures 6 h, Excercises 12 h, Case presentations (excercises) 12 h, Moodle exercises, case solving and  preparation for excercises 90 h. Total 160 h. Moodle is used in this course.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Four presented cases will be graded 0 - 5. Case presentation 100 %. The final course grade will be based on the average of the case grades.

**Course Materials:**

Material given during the lecture and exercises.

### CS30A1671: Service Innovation and Management, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ville Ojanen, Kalle Elfvengren

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Associate Professor, D.Sc. (Tech.) Ville Ojanen

**Aims:**

Student can
1. recognize and categorize the variety of services and service firms in modern industrial environment as well as understand their influence in management of industrial innovations
2. identify the characteristics of services and evaluate the similarities, differences and links between services and physical products
3. define the dimensions of service innovations
4. explain the processes of new service development
5. summarize the main managerial challenges in service innovation management
6. select and apply the suitable frameworks, tools and methods, to overcome some typical real-world challenges in service innovation management

**Contents:**

Typologies of service firms. Characteristics of services. Product-service systems in manufacturing industry. Knowledge-intensive business services. New service development process. Dimensions of service innovations. Productization of services. Supporting methods for service innovation management. Managerial challenges in service innovation management. Utilization of frameworks, methods and tools in service innovation management. Roles of different types of firms in service systems and networks. Value creation through services. Customer-centric service development.

**Teaching Methods:**

Lectures and exercises 20 h, 3rd period. Seminars 12 h, 4th period. Group assignments and project work 120 h. Total 152 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Written reports and seminars 100 %.

**Course Materials:**

Lecture notes. Other material, books and articles announced in the beginning of the course.

**Prerequisites:**

Recommended: B.Sc. on Industrial Engineering and Management, or equivalent knowledge

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 50

**Places for exchange-students? (Yes, number/No):**

Yes, 5

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### CS30A7402: Software and Application Innovation, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Mirva Hyypiä, Antti Herala, Jari Porras, Helinä Melkas

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Jari Porras
Professor, D.Sc. (Tech.) Helinä Melkas

**Aims:**

This course combines technology and technology management perspectives for cross-scientific approach in software and application innovation process. After completion of the course students have broader perspective on innovation process in some yearly changing technically focused area. Students know how

to innovate new meaningful software solutions and applications based on some technology, and what is the technical and business feasibility of the solution in domestic and international markets.

**Contents:**

Innovation management, idea generation and opportunity identification process. (Open) business models and technology commercialization in global markets. Product and service development. Basics and use cases of the selected technology, user-centric design and privacy perspectives in software and application development. The course is related to sustainability.

**Teaching Methods:**

Lectures 14 h. Innovation exercise to be given during the lectures 45 h, practical work (documentation) 45 h, independent group work 44 h, presentations 8 h. Total 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Practical work 100 %.

**Course Materials:**

To be announced later.

**Places for exchange-students? (Yes, number/No):**

Ýes, 10-15

**Places for Open University Students?(Yes, number/No):**

No

**Related to:**

to sustainability

### CS35A0153: Product Lifecycle Management, 6 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Jorma Papinniemi

**Note:**

This course is aimed for the students of Master's Degree level.

**Year:**

M.Sc. (Tech.) 2

**Period:**

3

**Teaching Language:**

English

**Teacher(s) in Charge:**

Lecturer, M.Sc. (Tech.) Jorma Papinniemi

**Aims:**

Student can
1. define and explain the concepts related to product data management and product life cycle management
2. recognize the company's product processes and understands their interaction with the company's overall operations
3. compare PLM-/PDM systems' characteristics, technical features and managerial functions and is able to see their role in product development and business management.

**Contents:**

Different views on product and lifecycle management. Product architectures and modularity. Product information modeling and change management. Requirements information management & systems engineering. Configuration process and configurators. PLM systems and their functionalities: managing generic products, individual products, items and documents. PLM project and system implementation. PLM for sustainability. Demos of PLM systems. Furure PCM in various industries.

**Teaching Methods:**

Lectures 21 h, seminars 14 h, 3rd period, as intensive studies. Course assignment 55 h and exam 68 h, 3rd period. Total 158 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Exam 60 %, project assignment and seminar participation 40 %.

**Course Materials:**

Journal articles and lecture material. Sääksvuori-Immonen: Product Lifecycle Management, Springer 2008. Forza-Salvador: Product Information Management for Mass Customization, Palgrave Macmillan, 2007. (partly)

**Prerequisites:**

B.Sc. on Industrial Management, or equivalent knowledge.

**Places for exchange-students? (Yes, number/No):**

Yes, 10.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### A210A0702: New Venture Management, 6 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Antero Tervonen

**Note:**

The course is an advanced level course, but it can also be placed in bachelor´s studies. Course enrollment via WebOodi by 12.9.2017. Course is carried out in cooperation with several courses of Mechanical Engineering and Electrical Engineering Degree Programmes. The number of participants is limited to 30 (own quotas for Business Administration students and Industrial Engineering and Management students; the final selection is made mainly based on success in studies).

**Year:**

B.Sc. (Tech.) 2-3, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Tech.) 1-2, M.Sc. (Econ. & Bus. Adm.) 1-2

**Period:**

1-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

University Lecturer, D.Sc. (Tech.) Antero Tervonen

**Aims:**

By the end of the course, students will be able to
- apply the skills and knowledge accumulated from previous courses into practice,
- plan and manage implementation of different business operations,
- manage and organize business as a whole and act as a manager,
- create various business and management documents and reports,
- communicate issues about the project with other firm members.

**Contents:**

Recruited business experts together with engineering experts (= mainly mechanical engineering students) form virtual firms (= small groups) with 10-20 individuals and develop elements of business activity around their product idea.
The entire staff of the firm is self-organized and takes care of the establishment of the virtual firm. Business experts formulate a business plan and financial plan in cooperation with engineering experts of the firm. The tasks of business experts also include planning of various business activities, implementing those activities and reporting: management, financial management, cost accounting, budgeting, finance, marketing, supply chain management and logistics in cooperation with product planning and manufacturing.
The board (= the teachers of different accompanied courses and a business mentor outside the university) supports firm operations. As the operations proceed (= during the academic year) several board meetings (= steering meetings) will be arranged. The goal is that the firms will have a real prototype of their product idea ready by the end of the first year of operations.

**Teaching Methods:**

Board steering sessions (= introductory lectures) 2 h, 1st period. Board steering sessions 6 h and the board meetings 3 h, 2nd period. Board steering sessions 2 h and the board meetings 4 h, 3rd period. Board steering sessions 2 h and the board meetings 2 h, 4th period. Independent project work by the staff of the virtual firm (the staff mainly defines working schedules, practices and responsibilities by itself) 139 h, 1st-4th periods. Total workload 160 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Grade 0-5, evaluation 0-100 points; project work 80 % (includes internal activities of the virtual firm, different written assignments of the business experts and performance in board meetings), peer review by the members of the firm 20 %.

**Course Materials:**

Material of the steering occasions of the board (= lecture notes). Material sought by the staff of the virtual firm.

**Prerequisites:**

The basic studies of bachelor's degree in Business Administration or bachelor's degree in Industrial Engineering and Management

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 30, based on success in studies.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

**Related to:**

to sustainability

### A330A0060: Managing Customer Relationships and Business Networks, 6 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Hanna Salojärvi, Joona Keränen, Asta Salmi

**Note:**

New course. Will replace CS10A0152 International Business Networks, CS10A0151 Business Relationships and Networks and A330A0050 Customer Relationship Management.

**Year:**

M.Sc. (Econ. & Bus. Adm.) 1, M.Sc. (Tech.) 1

**Period:**

3

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Econ. & Bus. Adm.) Asta Salmi
Associate Professor, D. Sc. (Econ. & Bus. Adm.) Hanna Salojärvi

**Aims:**

After completing the course the students are familiar with the theories of relationship marketing and network management, related concepts and models. The course provides the participants tools for understanding business relationships and networks, the strategic behavior of firms in this environment, and the managerial capabilities involved. The strong theoretical basis is combined with current relationship and network management material and implications.

On successful completion of the course, students: 1. Know the key theoretical frameworks related to business relationships and networks, and understand the principles of relationship marketing theory 2. Are familiar with customer relationship management as an organization wide strategic approach to managing customer relationships, 3. Are able to critically analyze the customer base, evaluate performance of customer relationships, and apply various strategies for managing customer relationships, 4. Understand the drivers of customer value and are able to design sustainable customer value propositions. 5. Identify the challenges of cross-sectoral and cross-national networks, 6. Understand and are able to evaluate the features of eco-industrial and sustainable business networks,

and sustainable supply chains, and contemporary challenges in managing them, 7. Have developed skills in teamwork, in active participation in discussions, in oral presentations, in writing reports, as well as in reflecting on and taking the responsibility for their own learning.

**Contents:**

The course focuses on the following main contents: Theoretical approaches to inter-organizational relationships and business networks. Strategic management of customer relationships, B2B marketing, customer value and value-based selling. Supplier relationships and sustainable supply chains. Challenges and management of cross-sectoral networks. Sustainable and eco-industrial networks and challenges of managing them.

**Teaching Methods:**

Lectures, assignments including reflection papers and learning diary, case studies. Active participation in class is required.
In class hours (34 hours): 26 hours of lectures and 8 hours of case study workshops.
Out-class hours: Preparation for lectures 10 h, individual reflection papers and learning diary 80 h, preparation for case studies 36 h. Total workload 160 hours.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

Grade 0-5, evaluation 0-100 points, Learning diary (including reflection papers) 70 % and case studies 30 %.

**Course Materials:**

Assigned readings (collection of articles). Lecture slides.

**Prerequisites:**

Basic knowledge of marketing. A330A0300 Strategic Global Marketing Management recommended.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Number of students attending is limited to 120 students. Priority is given to LBM degree students.

**Places for exchange-students? (Yes, number/No):**

Yes, 1-5, if they fit within the total number of 120 students after accepting LBM degree students.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions

### CS30A7370SS: Simulation Modelling in Industrial Management, 3 cp

**Validity:** 01.06.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Kortelainen

**Note:**

The number of course attendants is limited to 20. The course teacher selects 20 students after the course registration is over.

**Year:**

M.Sc. 1-2

**LUT Summer School time:**

7.-11.8.2017

**LUT Winter School time:**

First week of January

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher Samuli Kortelainen, LUT

**Aims:**

Learning outcomes:

The amount of data available for decision makers is constantly increasing. The increase of data enables new opportunities for managers, but also creates a demand to develop systems that can generate this data into usable intelligence. Simulation techniques offer interesting option for managers to better understand and develop firm's business processes.

The key simulation skills that the student has to possess after successful completion of the course:

- Understanding on what system and complexity theories mean, and what are their business implications
- Capability and design simulations model with a systematic process
- Understand the possibilities, but also restrictions, of simulation modelling as an analysis tool
- Practical simulations skills with the three most common simulation methods
  - o System dynamics
  - o Discrete event simulation
  - o Agent based modelling
- Skill to use simulation models to conduct tests on system performance

**Contents:**

This course is designated to explore two critical aspects of simulation modelling to business management:
- The analysis and development of already existing processes
- The analysis and testing of new proposed process

First, the natural way to use simulation modelling is to model the firm's current operations. The goal in this kind of simulation is to understand and then develop firm's processes to perform better. As such, simulation offers an opportunity to support management of firm's operational processes. During the course, this methodology is used to simulate firm's manufacture processes, but also more abstract service processes.

The second way to utilize simulation is to model future processes. This enables testing the effect of a new innovation to a given process. This allows analysis on the true value of an innovation and thus supports management of innovations. This application area is the focus of later part of the course.

**Teaching Methods:**

The teaching is dominantly interactive workshop in small groups supported by in-class lectures. In addition there is a pre-course essay for the course, which has 3 questions. Expected length is 20 pages.

- In-class teaching 6 hours
- Workshop + learning diary at the end of each lecture day 24 hours
- Pre-course work 48 hours

Total workload 78 hours
Maximum course attendants is 20 persons. Final student selection is made by the teacher after the registration is over.

**Assessment:**

Final grade 0-5. Evaluation:
- essay 60 %
- learning diary 40 %

**Course Materials:**

Course slides to be distributed during the course.

**Prerequisites:**

- Previous studies in management are strongly suggested
- Skills that assist learning
  - o Basic Excel and coding skills
  - o Good skills in logical thinking
  - o Basic math skills
  - o Positive attitude

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, maximum course attendants is 20 persons. Final student selection is made by the teacher after the registration is over.

### A330A5000SS: International Marketing of High Technology Products and Innovations, 3 cp

**Validity:** 01.06.2012 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Sanjit Sengupta, Sanna-Katriina Asikainen

**Note:**

The course topics are related to sustainable development.

**Year:**

M.Sc. 2

**LUT Summer School time:**

24.-28.7.2017

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, LUT

**Aims:**

Learning outcomes:
- Distinguish the special characteristics of high technology marketing environment (like the type of innovation, market and technology uncertainties, network externalities) and assess external high technology environments (e.g. relating to competitive landscape, consumer behavior, markets) in global scale.
- Evaluate and justify marketing strategies in high technology environments.
- Make marketing decisions in high technology environments.

Course aims to provide a deep understanding of the functions of marketing regarding challenges and opportunities in high technology products and markets; assist the participants to understand the virtue and limitations of traditional marketing thinking and tools in emergent high technology markets.

**Contents:**

- Strategy and corporate culture in high tech firms.
- Partnerships and alliances.
- Marketing research in high tech markets.

- Understanding high tech customers.
- Product development and management issues in high tech markets.
- Pricing considerations in high tech markets.
- Advertising and promotion in high tech markets.

**Teaching Methods:**

- Lectures and in-class assignments 30 hours
- Preparing for lectures 25 hours
- Preparing for exam 25 hours

Total workload 80 hours.

**Assessment:**

Final grade 0-5. Evaluation 0-100 points:
- Exam 50 points
- In-class assignments 30 points
- Class participation 20 points

**Course Materials:**

- Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2010) Marketing of High-Technology Products and Innovations. Third Edition. Pearson Prentice Hall. Web site http://marketinghightech.net/
- Assigned reading.

**Prerequisites:**

For summer school students: previous studies in business recommended.

For MIMM degree students at LUT: Internationalization of the Firm and Global Marketing, Strategic Global Marketing Management, Technology and Innovation Management.

*Exchangeable courses*

**CS30A1684SS: Advanced Course in Strategic Management, 3 cp**

**Validity:** 01.06.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Kortelainen

**Note:**

**LUT students: the student who has completed the course CS30A1682 Advanced Course in Strategic Management can not include this course into the LUT degree.**

**Year:**

M.Sc. 1-2

**LUT Summer School time:**

31.7-4.8.2017

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher Samuli Kortelainen, LUT

**Aims:**

Learning outcomes.

Strategic management literature is a widely research topic, that has led to a wide and many times confusing and even contradictory literature. In order to fully understand the current state of literature, the lens needs to be first turned to the history of different strategic schools. Therefore, the course starts from the roots of strategy management and then builds a comprehensive view to the current status of strategic management literature.

After the successful completion of course the student has:

- Comprehensive picture of the current state of strategic management theory and understanding reasoning behind different strategic management theories
- Understanding on the limitations and restrictions in current strategic management theory and their practical implications
- Holistic view to current new themes linking strategic management theories to other industrial management disciplines

**Contents:**

**Main schools of strategic management**
The course begins on looking at the development history of main strategic management schools, where the goal is to identify similarities and differences between different literature streams.

**The challenges and criticism of current strategic management theories**
Although strategic management theories are widely applied, they are also subjected to wide range of criticism. The second part of lectures focuses on these critical aspects of strategic management.

**Current development paths of strategic management theory**
Third part focuses on the various detailed development steps in strategic management literature to counter or point critical points in original theories.

**Linking strategic management to other management theories**
There are multiple different management literature streams (e.g. marketing, supply-chain, and innovation) that also tackle strategic issues. The fourth part of lectures focuses on bridging these management theories.

**New entries to strategic management discussion**
The final part of lecture series focuses on raising themes in strategic management such as multi-sided markets, business models, and data analytics.

**Teaching Methods:**

Lectures 16 hours
In-class room exercises 10 hours
Essay summarizing critical strategic management articles, workload 24 hours
Preparing for the exam 16 hours; final exam executed on the final day of the course 12 hours

Total workload 78 hours

**Assessment:**

Final grade 0 – 5:

Exam 60%
Essay 40%

**Course Materials:**

Course slides and selected articles to be announced in the class.

**Prerequisites:**

- Successfully completed Bachelor or higher level studies in Industrial Management
- Good understanding on basic strategic management concepts
- Basic knowledge on other management topics (marketing, innovation management)

**CS30A1655: Advanced Course in Strategic Management, 6 cp**

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Kortelainen

**Note:**

The student who has completed the course CS30A1684 Advanced Course in Strategic Management can not include this course into the LUT degree.

**Year:**

M.Sc. (Tech) 2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Post-Doctoral Researcher, D.Sc. (Tech.) Samuli Kortelainen

**Aims:**

Strategic management literature is a widely research topic, that has lead to a wide and many times confusing and even contradictory literature. In order to fully understand the current state of literature, the lens needs to be first turned to the history of different strategic schools. Therefore, the course starts from the roots of strategy management and then builds a comprehensive view to the current status of strategic management literature. After the successful completion of course the student has:
1. Comprehensive picture of the current state of strategic management theory o Understanding reasoning behind different strategic management theories
2. Understanding on the limitations and restrictions in current strategic management theory and their practical implications
3. Holistic view to current new themes linking strategic management theories to other industrial management disciplines

**Contents:**

1. Main schools of strategic management The course begins on looking at the development history of main strategic management schools, where the goal is to identify similarities and differences between different literature streams.
2. The challenges and criticism of current strategic management theories Although strategic management theories are widely applied, they are also subjected to wide range of criticism. The second part of lectures focuses on these critical aspects of strategic management.
3. Current development paths of strategic management theory Third part focuses on the various detailed development steps in strategic management literature to counter or point critical points in original theories.

**Teaching Methods:**

Lectures 18 h, in-class room exercises 10 h, seminarwork and presentation 50 h, preparation to exam 50 h. Total 128 h. Individual 24 h exam.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Assessment:**

0 - 5. Exam 50 %, exercise 50 %.

**Places for exchange-students? (Yes, number/No):**

Yes, 10

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

# Descriptions of courses and study modules not included in the degree structures

## YmDSaEnLi: , 20 - 30 cp

**Validity:** 01.08.2016 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Obligatory Studies 14 ECTS cr*

### BH60A2601: Climate Change, 5 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Lassi Linnanen, Maija Leino, Sanni Väisänen

**Note:**

Replaces the course BH60A2600 Ilmastonmuutos.
Enrolment for the course 18.12.2016 by the latest.

**Year:**

B.Sc. (Tech.) 2

**Period:**

3-4

**Teaching Language:**

Finnish and English

**Teacher(s) in Charge:**

Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen

**Aims:**

Upon completion of the course the student is expected to be able to
1. define factors that affect the climate and the reasons and consequences of climate change,
2. explain how the climate change can be curbed, and
3. calculate carbon footprints.

**Contents:**

Students are introduced to following subjects on this course: The green house effect, climatic change through history, future scenarios, carbon cycle, radiative forcing, the consequences of climate change, preventing climate change, carbon footprint.

**Teaching Methods:**

2 intensive week: 14 h of lectures. Share of independent work (approx. 64 h). Learning diary, done individually (approx. 14 h). Written assignment, incl. literature search and calculations (approx. 50 h). Total workload 78 h.

**Assessment:**

0 - 5. Written assignment 75 %, learning diary 25 %.

**Course Materials:**

1. Muutamme ilmastoa. Ilmatieteen laitoksen tutkijoiden katsaus ilmastonmuutokseen. 2008. Toim. Nevanlinna Heikki. 2. Maailman tila 2009. Lämpenevään maailmaan. 2009. Worldwatch-instituutti.

**Prerequisites:**

BH60A0000 Ympäristötekniikan perusteet or equivalent knowledge.

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BH60A4700: Climate Finance and Carbon Markets, 3 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Virgilio Panapanaan, Lassi Linnanen

**Year:**

M.Sc. (Tech.) 1

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen, D.Sc. (Tech.) Virgilio Panapanaan

**Aims:**

1. to know and understand the new global negotiation, agreement and policy on climate change;
2. to understand and explain the global climate finance and its role in mitigation and adaptation;
3. to learn the principles of emission trading and explain its role in the carbon markets inside

and outside Europe;
4. to gain insights on the emergence and formation of carbon markets worldwide; and
5. and to explain the impacts of an emission trading scheme on different sectors/stakeholders.

**Contents:**

Topics include: Global climate finance and the new climate agreements, climate finance architecture, actors and instruments, mitigation and adaptation climate financing in developing countries, carbon markets and different emerging carbon trading schemes, EU emission trading scheme, and the impacts of climate finance and emission trading.

**Teaching Methods:**

3rd period: 14 h of lectures 4th period: Assignment and seminar. Examination. Independent study (approx. 66 h): assignment 24 h, examination and preparation for it 36 h, seminars 4 h. Total workload 78 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 70 %, assignment 30 %.

**Course Materials:**

Will be announced during the course.

**Places for exchange-students? (Yes, number/No):**

Yes, unlimited.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BL20A1300: Energy Resources, 6 cp

**Validity:** 01.08.2014 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Michael Child, Christian Breyer

**Note:**

Suitable also for doctoral studies

**Year:**

M.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Christian Breyer

**Aims:**

Upon completion of the course the student will be able to: 1. Identify the constraints and potentials of all relevant energy sources in a global context. 2. Know all relevant energy conversion technologies on the basis of their energy resource. 3. Analyse the principal structure of future energy systems on the basis of energy resource characteristics. 4. Describe the special relevance of wind energy and solar energy in the ongoing energy transformation.

**Contents:**

The main energy resources for the current and future energy system are: crude oil, natural gas, coal, uranium, hydro power, bioenergy, solar energy, wind energy, geothermal energy, and ocean energy. These energy resources have different theoretical, technical and economic potentials as well as geographic variations in availability. The resources also differ considerably in the impact of the emissions related to the respective energy conversion technologies being relevant for the degree of sustainability. A broad variety of energy conversion technologies at different levels of maturity are used for utilizing the resources. The availability of resources and related emissions and techno-economic maturity of related energy conversion technologies provide a fundamental structure for the future energy system and the related energy transformation pathway.

**Teaching Methods:**

Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, exercises 14 h, 2nd period. Examination. Total workload 156 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, examination.

**Course Materials:**

Material handed out in class and made available on Moodle.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

*Valitaan vaihtoehtoisia opintojaksoja siten, että sivuopintojen vaadittava minimiopintopistemäärä tulee täyteen tutkinto-ohjelman vaatimusten mukaisesti.*

**BH40A0101: Renewable Energy, 3 cp**

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Antti Uusitalo, Aki-Pekka Grönman

**Year:**

B.Sc. (Tech.) 2

**Period:**

4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Associate professor, D.Sc. Aki Grönman

**Aims:**

Upon completion of the course the students will be able to: 1. describe the operation principle of various power plant types using renewable energy sources, 2. compare the benefits and disadvantages of power plants using renewable energy sources in relation to each other and traditional power plants, 3. understand the factors affecting power plant efficiencies, and 4. select suitable power plants for a given purpose.

**Contents:**

Wind power, wind turbine types, water power, hydrogen economy and fuel cells, wave power, tidal power, biomass and biogas utilization, solar power, geothermal energy, principles and efficiency calculations of renewable energy power plants.

**Teaching Methods:**

Lectures 12 h, tutorials 12 h, independent study, homework, quizz. 4. period. Total workload 78 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, quizz 20 %, homework 80 %.

**Course Materials:**

Lecture material in Moodle. Further material will be announced during lectures.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BH60A1800: Introduction to Environmental Law, 5 cp

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Katariina Koistinen, Lassi Linnanen, Kimmo Malin, Hilkka Heinonen

**Note:**

Intensiiviopintojaksona 4. periodilla. Poikkeava ilmoittautumisaika ennakkotehtävien vuoksi. Ilmoittautuminen viimeistään 1.2.2018.

**Year:**

B.Sc. (Tech.) 2

**Period:**

4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen

**Aims:**

Upon completion of the course the student is expected to be able to
1. identify solutions provided by environmental law,
2. search for information related to environmental law,
3. prepare a summary on parties involved in environmental decision-making and related control methods, and
4. interpret official legal norms related to environmental issues and apply them to practical work.

**Contents:**

Influencing environmental problems through legislation. Steering methods of environmental policy. The structure of environmental administration. Basics of decision-making in environmental administration. Central environmental legislation. Environmental law as a multidisciplinary environmental research field. Collecting legal environmental data.

**Teaching Methods:**

4th period: 30 h of lectures 30 h, intensive teaching. Share of individual work (approx. 100 h): 3rd - 4th period: Advance assignments (approx. 20 h). 4th period: Learning diary, individual work (approx. 80 h). Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Advance asssignments 20 %, learning diary 80 %.

**Course Materials:**

Useful literature will be announced during the lectures. Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BH61A0200: Energy Economics, 4 cp

**Validity:** 01.08.2007 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Aija Kivistö, Tapio Ranta

**Year:**

B.Sc. 2

**Period:**

3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

professori, TkT Tapio Ranta

**Aims:**

Upon completion of the course the students will be able to utilise energy economic calculation methods and to calculate the additional cost in the energy production costs caused by emission trading. Students will be able to describe the basic concepts of Finnish energy economics and explain the structure of energy taxation in Finland, and calculate the energy taxes of fuels. Students will understand the structure of energy tariffs, and will be able to compile a duration curve of the consumption curve of energy.

**Contents:**

Energy statistics. The variation in energy demand and duration curves. Calculation methods for energy production costs. Profitability calculations of energy projects. Environmental impacts in energy production, especially carbon dioxide emissions. Energy markets. The effect of emission trading on the price of electricity, and energy tariffs. Energy taxation and the pricing system of natural gas. Energy economics in Finland. The need for investments in electricity production. Climate strategy. Fuel economics. Energy scenarios.

**Teaching Methods:**

3rd period: 12 h of lectures, 6 h of tutorials, homework. 4th period: 12 h of lectures, 6 h of tutorials, homework. Written examination. Total workload 104 h, containing 68 h of self-study.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 80%, homework 20 %.

**Course Materials:**

Mikko Kara et al.: Energia Suomessa: Tekniikka, talous ja ympäristövaikutukset 2004, chapters 6 and 8. Material on Moodle.

**Prerequisites:**

BH61A0000 Fundamentals of Energy Economics attended. Recommended: BH50A0200 Introduction to Power Plant Engineering.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BL20A0201: Power Exchange Game for Electricity Markets, 3 cp

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Samuli Honkapuro, Nadezhda Belonogova

**Year:**

M.Sc. (Tech.) 1

**Period:**

2-3

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Samuli Honkapuro, M.Sc. (tech.) Nadezda Belonogova

**Aims:**

Upon completion of the course the student will be able to:  Plan electricity purchase and sale in an economically viable way, recognize the most common risk management instruments and basic mechanisms of demand response in electricity markets, and exploit financial products of the power exchange in risk management and trade electricity in day ahead and intraday markets. These skills will be practised in a power exchange game, after which the student will be able to analyse and interpret the game results.

**Contents:**

Electricity purchase/sale, OTC markets, physical products on the power exchange (Elspot and Elbas), financial products on the power exchange (DS Futures and Futures), risk management.

**Teaching Methods:**

Lectures 8 h, weekly game situation practice 40 h, 2nd and 3rd period. Written homework, intermediate report and final report. Total workload 78 h. The lectures focus on the key learning objectives in the topic. Successful completion of the course requires student’s active independent work.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, written report 100 %.

**Course Materials:**

Lectures, game instructions, websites

**Prerequisites:**

BL20A0400 Electricity Markets

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**BL20A0400: Electricity Market, 5 cp**

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Salla Annala, Jarmo Partanen

**Note:**

Suitable also for doctoral studies.

**Year:**

M.Sc. (Tech) 1

**Period:**

1

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

professori, TkT Jarmo Partanen

**Aims:**

Upon completion of the course the student will be able to: 1. describe the characteristics of the different business sectors in the Nordic electricity market, 2. explain electricity price formation and model electricity consumption, 3. explain the operation principle of the power exchange, 4. identify and describe the products of the power exchange, 5. select the right risk management method for electricity trade, 6. describe the tasks of the different parties in an electric power system in maintaining technical and commercial power balance, 7. conduct the balance settlement, 8. price the products of electricity trade and distribution, 9. describe why and how electricity distribution business is regulated.

**Contents:**

The development of electricity markets, loads on the electricity network and load forecasts, power exchange, electricity trade, balance management, the fundamentals of pricing and regulation of distribution business.

**Teaching Methods:**

28 h of lectures, 14 h of tutorials, 1st period. Independent studies. Written examination. Total workload 130 h. The lectures focus on the core learning objectives in the topic. Successful completion of the course requires student's active independent work.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, examination 100 %.

**Course Materials:**

Material distributed in class.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BL20A1400: Renewable Energy Technology, 6 cp

**Validity:** 01.08.2015 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Michael Child, Christian Breyer

**Note:**

Suitable also for doctoral studies

**Year:**

M.Sc. (Tech.) 1

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Christian Breyer

**Aims:**

Upon completion of the course the student will be able to: 1. Identify the major renewable energy (RE) conversion technologies, mainly converting resources to electricity. 2. Describe

the major characteristics of the technologies, in particular applications, efficiency, economics, industrial scale and future prospects. 3. Analyse the need for storage technologies and their different fields of application based on their key technical and economic features.

**Contents:**

RE resources such as wind energy, solar energy, hydro power, bioenergy, geothermal energy and ocean energy can be utilized by a variety of different energy conversion technologies. The course is focused on the conversion of the resources to electricity. The RE technologies discussed in the course are: wind turbines, solar photovoltaics, solar thermal electricity generation, hydro power plants, biogas plants, solid biomass firing plants, biomass combined heat and power plants, geothermal power plants, tidal energy, wave energy and ocean current energy. The storage technologies covered comprise a general overview and in particular include battery storage, pumped hydro storage and power-to-gas technologies. All technologies are classified with respect to their applications, efficiency, maturity, economics, industrial scaling and expected relevance for the ongoing energy transformation.

**Teaching Methods:**

3rd period lectures 14 h, exercises 14 h. 4th period lectures 14 h, exercises 14 h, examination. Total workload 156 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, examination 100 %

**Course Materials:**

Material handed out in class and made available on Moodle.

**Places for exchange-students? (Yes, number/No):**

Yes, no specific limit

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BL20A1500: Energy Scenarios, 6 cp

**Validity:** 01.08.2015 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Christian Breyer, Michael Child

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Christian Breyer

**Aims:**

Upon completion of the course the student will be able to: 1. Describe the sustainability requirements of future energy systems as the major guard rail for the energy transformation. 2. Analyse energy transformation scenarios and identify the key technologies and setups for sustainable energy progress. 3. Describe the energy transformation in all sectors, the major technologies, the required transformation period and entire system cost optimization. 4. Describe the special role of power technologies for the energy transformation. 5. Recognize the difference between standard levelized cost of energy and total societal cost of energy.

**Contents:**

Energy demand is an aggregate of power, heat, cooling, mobility, agriculture and industrial energy needs. The demand has to be matched with supply of energy fulfilling sustainability criteria, safety requirements and societal acceptance for the least cost. A complete set of demand curves, technical characteristics of all major technologies, current and projected technology costs and emission factors are taken into account for sustainable energy transformation pathway formulation. The special relevance of wind energy and solar photovoltaics, the increasing relevance of power technologies, the role of storage technologies and the necessity of societal cost of energy are discussed in detail. Real scenarios for Finland, Europe and the World used as references.

**Teaching Methods:**

1st lectures 14 h, exercises 14 h, 3rd lectures 14 h, exercises 14 h, presentation/oral examination. Total workload 156 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, presentation/oral examination 100 %

**Course Materials:**

Material handed out in class and made available on Moodle.

**Prerequisites:**

BL20A1300 Energy Resources and BL20A1400 Renewable Energy Technology (at least one of the two courses)

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BL20A1600: Smart Grids, 5 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Tero Kaipia, Jarmo Partanen, Jukka Lassila, Samuli Honkapuro

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor Samuli Honkapuro, professor Jarmo Partanen, associate professor Jukka Lassila, M.Sc. Tero Kaipia

**Aims:**

Upon completion of the course the student will be able to 1. Label the key elements and functionalities of the smart grid system 2. Analyze the impacts of the smart grid elements on electricity distribution system and electricity markets 3. Document and present orally the results of the seminar work 4. Provide both written and oral peer review.

**Contents:**

Smart grid concept, demand side management, energy storages, distributed generation, electric vehicles, self-healing networks. In addition, annually changing topical subjects.

**Teaching Methods:**

Lectures 14 h in 3rd period. Independent seminar work. Presentation of the seminar work, peer review of a written seminar work and working as an opponent in seminar in 4th period. Course is suitable for distance learning.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, based on the evaluation of the teachers and peers. The course is evaluated based on seminar work (written and oral presentation), and student’s work as a reviewer and an opponent.

**Course Materials:**

Study materials will be informed during lectures.

**Prerequisites:**

Basic knowledge of the electricity distribution and electricity markets.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**BL40A2301: Energy Efficiency, 6 cp**

**Validity:** 01.08.2013 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Tero Ahonen, Jero Ahola, Tero Kaipia, Antti Kosonen, Lasse Laurila

**Year:**

M.Sc. (Tech.) 1

**Period:**

4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc (Tech.) Jero Ahola, Postdoctoral Researcher, D.Sc (Tech.) Tero Ahonen, different lecturers

**Aims:**

Upon completion of the course the student will be able to: 1. determine actions for the energy efficiency of the energy conversion process, 2. estimate the overall energy efficiency of the energy conversion system, 3. identify applications of electric energy usage and apply methods that can be used to improve the energy efficiency.

**Contents:**

The course provides the student with an introduction to the significance and development potential of energy efficiency in energy production, transmission, distribution and end use. The focus is on electric energy and systems approach. The lecture topics are the efficiency of energy production processes, the efficiency of electricity transmission and distribution and the efficiency of energy end use. The course is arranged as a series of lectures delivered by experts. The lecture topics may vary from year to year.

**Teaching Methods:**

Lectures 12 h, individual home works, demo lectures, examination. Total workload 156 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, examination 100 %, accepted individual home works.

**Course Materials:**

Lecture material, material announced by lecturers.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

## YmDSaTekRat: , 20 - 30 cp

**Validity:** 01.08.2016 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Obligatory Studies 11 ECTS cr*

### BH40A0101: Renewable Energy, 3 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Antti Uusitalo, Aki-Pekka Grönman

**Year:**

B.Sc. (Tech.) 2

**Period:**

4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Associate professor, D.Sc. Aki Grönman

**Aims:**

Upon completion of the course the students will be able to: 1. describe the operation principle of various power plant types using renewable energy sources, 2. compare the benefits and disadvantages of power plants using renewable energy sources in relation to each other and traditional power plants, 3. understand the factors affecting power plant efficiencies, and 4. select suitable power plants for a given purpose.

**Contents:**

Wind power, wind turbine types, water power, hydrogen economy and fuel cells, wave power, tidal power, biomass and biogas utilization, solar power, geothermal energy, principles and efficiency calculations of renewable energy power plants.

**Teaching Methods:**

Lectures 12 h, tutorials 12 h, independent study, homework, quizz. 4. period. Total workload 78 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, quizz 20 %, homework 80 %.

**Course Materials:**

Lecture material in Moodle. Further material will be announced during lectures.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

**BH50A0200: Power Plant Engineering, 4 cp**

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Kari Luostarinen, Esa Vakkilainen, Juha Kaikko

**Year:**

B.Sc. 3

**Period:**

3

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Docent, D.Sc. (Tech.) Juha Kaikko, Professor, D.Sc. (Tech.) Esa Vakkilainen

**Aims:**

Upon completion of the course the students will be able to 1. explain the basic processes of thermal power plants (excl. nuclear energy) and the impact of various factors on process efficiency, 2. apply mass and energy balances into energy production processes, and 3. calculate the operating values of basic power plant processes and the costs of energy production.

**Contents:**

The operation of thermal power plants and power plant processes. Calculation methods of cycle processes. Condensing power plants, back-pressure power plants, heating power plants, gas turbine power plants, combined cycle power plants. Calculation of production costs.

**Teaching Methods:**

3rd period: 12 h of lectures, 6 h of demonstration lectures, 12 h of tutorials. Assignment. Written examination. Tutorials and the assignment must be completed before the examination. Independent study approximately: Assignment 20 h. Preparation for the examination 18 h and the examination 3 h. Studying given material 33 h. Total workload 104 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 80 %, assignment 20 %.

**Course Materials:**

Huhtinen, Markku et al.: Voimalaitostekniikka, Finnish National Board of Education, 2013. Lecture notes.

**Prerequisites:**

BH20A0700 Fundamentals of engineering thermodynamics or BH20A0800 Engineering thermodynamics attended.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 10

**Related to:**

to sustainability

### BH60A2401: Energy Recovery from Solid Waste, 4 cp

**Validity:** 01.08.2010 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Mika Horttanainen, Mika Luoranen

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Mika Horttanainen

**Aims:**

Upon completion of the course the student is expected to be able to
1. describe the properties of waste as fuel,
2. explain the most common waste-to-energy technologies and their suitability for different energy recovery applications and materials,
3. determine the waste-to-energy recovery potential of a region,
4. describe the most important flue gas emissions and their reduction technologies characteristic for the combustion of waste, and
5. analyse the role of energy recovery in municipal waste management.

**Contents:**

Waste-to-energy in Finland and other countries, properties of waste as a fuel, waste handling before thermal conversion, preparation of recycled fuel, mass combustion of waste, combustion of recycled fuel, gasification of waste, energy recovery in combustion of waste, emission reduction during combustion, flue gas treatment, utilisation and treatment of ash, anaerobic digestion of waste, landfill gas utilisation in energy production.

**Teaching Methods:**

1st period: 14 h of lectures, 14 h of exercises. 2nd period: 4 h of lectures.
2nd period: Assignment info (2 h). Group assignment including calculations, written group report (approx. 44 h). Excursion (approx. 6 h). Written examination and preparation for it, approx. 20 h. Total workload 106 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Assessment:**

0 - 5. Examination 50 %, practical assignment 50 %.

**Course Materials:**

Course book (to the appropriate extent): Niessen, W., 2002. Combustion and incineration processes. Marcel Dekker, Inc., New York. SBN: 0-8247-0629-3. Moodle.

**Prerequisites:**

Basic knowledge on thermodynamics, chemistry and power plant technology.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

*Valitaan vaihtoehtoisia opintojaksoja siten, että sivuopintojen vaadittava minimiopintopistemäärä tulee täyteen tutkinto-ohjelman vaatimusten mukaisesti.*

**BH50A0500: Introduction to Combustion and Boiler Technology, 5 cp**

**Validity:** 01.08.2007 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Esa Vakkilainen

**Year:**

B.Sc. 2

**Period:**

3

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professori TkT Esa Vakkilainen

**Aims:**

Upon completion of the course the students will be able to 1. describe the combustion processes, 2. describe the operation of the most common boilers burning different fuels, 3. define the fundamentals and configuration options of water-steam cycles, and 4. understand the formation of gaseous emissions and their most typical reduction methods.

**Contents:**

The characteristics of fuels. Combustion calculations. The functioning of the water-steam system. The definition of the boiler efficiency. Types of boilers. Combustion methods and equipment. Gasifiers. The effect of different fuels and combustion mechanisms on emission formation.

**Teaching Methods:**

3rd period: 12 h of lectures and 12 h of tutorials. Written assignment and laboratory assignment. Succesfully completed written examination, in addition to which students must successfully complete the tutorial exercises, written assignment and laboratory assignment before taking the examination. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 70 %, written and laboratory assignments 20 %, tutorials 10 %.

**Course Materials:**

Lecture notes. IFRF - Finnish Flame Research Committee, Poltto ja Palaminen, 2nd edition. Teir, Sebastian, Steam Boiler Technology, 2nd ed. 2006. Markku Huhtinen et al. Höyrykattilatekniikka, 2004. Vakkilainen, Esa, Steam generation from Biomass, 2016.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BH50A1701: District Heating, 4 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Juha Kaikko, Esa Vakkilainen

**Note:**

Replaces the course BH50A1700 Kaukolämmitys.

**Year:**

M.Sc. (Tech.) 1

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Docent, D.Sc. (Tech.) Juha Kaikko, Professor, D.Sc. (Tech.) Esa Vakkilainen

**Aims:**

Upon completion of the course the student will be able to 1. describe the basics of district heating in the world and in Finland, 2. explain the technical solutions of generating and delivering district heating at a detailed level, 3. dimension heat output and annual thermal energy necessary for various heating applications, 4. dimension the district heating system and its components, 5. understand and calculate various losses, 6. evaluate the basic design and use of district heating networks and heat production.

**Contents:**

The formation of energy demand in buildings and the consumption variation. Consumer devices, connections and energy measurement. Piping construction as well as network planning and control. Production of district heating, district heating plants and heating power plants. Cost and tariffs for district heating.

**Teaching Methods:**

3rd period: 10 h of lectures. Independent study 14 h. Independent calculations and online tasks 20 h. 4th period: Written assignment 48 h. Evaluating assignments 12 h. Total workload 104 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Written assignment 60 %, independent calculations and online tasks 40 %.

**Course Materials:**

Koskelainen, Lasse et al.: Kaukolämmön käsikirja, Energiateollisuus, 2006. Lecture notes.

**Places for exchange-students? (Yes, number/No):**

Yes, 5

**Places for Open University Students?(Yes, number/No):**

Yes, 5

### BH50A1800: Fundamentals of Energy Systems Planning, 6 cp

**Validity:** 01.08.2011 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Esa Vakkilainen

**Year:**

M.Sc. 2

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professori, TkT Esa Vakkilainen

**Aims:**

Upon completion of the course the students will be able to 1. use the “Systems Engineering” method for the definition of initial data in energy system projects, 2. describe the implementation phases of the energy system projects, and 3. demonstrate practical skills for the planning, management and implementation of energy system projects and for the estimation of the systems’ environmental impacts.

**Contents:**

Students develop their own system product (steam, wind or solar power plant) through team and project work. During the course, students apply the “Systems Engineering” method, which consists of the following: the definition of the requirements for the product, testing, validation, the assessment and comparison of alternatives, the management and specification of subentities, risk assessment, reliability analysis, the optimisation and documentation of implementation. The student assumes one of the roles for the team: project manager, technical engineer, environmental engineer, cost engineer. Project planning and execution. Cost analysis. Estimation of environmental impact. The use of computer software as a planning aid.

**Teaching Methods:**

1st period: 10 h of lectures and planning tutorials. 2nd period: 8 h of lectures and planning tutorials and 2+2 h of seminar. Independent study approximately: Written assignment 80 h. Presentation preparation 14 h. Studying given material 40 h. The planning assignment is carried out in a team. Total workload 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Written report of the planning assignment 70 %, oral presentation 30 %.

**Course Materials:**

Lecture notes.

**Prerequisites:**

Recommended: BH50A0200 Introduction to Power Plant Engineering and BH50A0800 Steam Boilers.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BH50A1900: Planning of Energy Systems, 4 cp

**Validity:** 01.08.2012 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Esa Vakkilainen

**Year:**

M.Sc. 2

**Period:**

3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professori, TkT Esa Vakkilainen

**Aims:**

Upon completion of the course the students will be able to 1. describe energy system projects including the related technical dimensioning, the power plant project execution, the siting of the power plant and the minimization of the environmental impact, 2. participate in the evaluation of environmental impacts, licensing and decision making in energy system projects, 3. optimize the power plant and its components, and 4. compare factors affecting the power plant economics.

**Contents:**

Students continue to develop their own system product (steam, wind or solar power plant) through team and project work. During the course, students apply the “Systems Engineering” method, which consists of the following: the definition of the requirements for the product, testing, validation, the assessment and comparison of alternatives, the management and specification of subentities, risk assessment, reliability analysis, the optimisation and documentation of implementation. The student assumes one of the roles for the team: e.g. project manager, technical engineer, environmental engineer, cost engineer. Project planning and execution. Cost analysis. Estimation of environmental impact. Modelling of the power plant for the planning. The components of power plant. The dimensioning and optimisation of components. Fluid dynamic dimensioning. Thermal engineering simulation. The use of computer software as a planning aid. Documentation and public presentation of results.

**Teaching Methods:**

3rd period: 10 h of lectures and planning tutorials. 4th period: 8 h of lectures and planning tutorials and 2+2 h of seminar. Independent study approximately: Written assignment 50 h. Presentation preparation 14 h. Studying given material 18 h. The planning assignment is carried out in a team. Total workload 104 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Written report of the planning assignment 70 %, oral presentation 30 %.

**Course Materials:**

Lecture notes.

**Prerequisites:**

BH50A1800 Energiajärjestelmien suunnittelun perusteet.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

**BH61A0600: Bioenergy, 3 cp**

**Validity:** 01.08.2011 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Tapio Ranta

**Year:**

M.Sc. (Tech.) 1

**Period:**

1

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Tapio Ranta

**Aims:**

Upon completion of the course the student will be able to understand the meaning of bioenergy, alternative biomass resources, supply methods, refining and end-user applications; describe the quality properties of solid biofuels and how they are measured and evaluated by using standards; and explain the meaning of sustainability in bioenergy systems.

**Contents:**

The role of bioenergy in the EU energy policy, incentive programmes and future plans. Raw-material sources of bioenergy, potential resources and current use. Biomass supply systems and logistics. Refined biofuel commodities, biogas and liquid biofuels. Biomass international trade. Quality properties of solid biofuels, quality measurement and standards. Sustainable bioenergy.

**Teaching Methods:**

1st period: 12 h of lectures. Written examination. Total workload 78 h, containing 63 h of self-study.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 100 %.

**Course Materials:**

Course Materials
Energy Visions 2050, VTT. 2009. Chapters 2, 4.4, 5.2 - 5.4. Additional material will be announced later during lectures.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BL20A0700: Introduction to Electrical Power Systems, 4 cp

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Juha Haakana, Jukka Lassila

**Year:**

B.Sc. 3

**Period:**

1

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

tutkijaopettaja, TkT Jukka Lassila, tutkijatohtori, TkT Juha Haakana

**Aims:**

Upon completion of the course the student will be able to: 1. describe the essential operating principles of an electric power system, i.e., principles of power balance and voltage control management, 2. calculate the voltages, load currents, losses, symmetrical fault currents and costs in electric power systems, 3. describe the basic phenomena and calculation principles related to static and transient stability.

**Contents:**

Operation of electricity market. Interconnection of electric power systems. Components and their equivalent circuits in electric power systems. Calculation of transmission and distribution networks. An overview of high voltage and equipment technology. Electricity quality factors.

**Teaching Methods:**

14 h of lectures, 14 h of tutorials, lectures + exercises of 14 h, assignment, 1st period. Written examination. Total workload 104 h. The lectures focus on the core learning objectives in the topic. Successful completion of the course requires student’s active independent work.

**Examination in Examination schedule (Yes/No):**

Yes (in Finnish)

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, examination 100 % + accepted assignment.

**Course Materials:**

Elovaara & Haarla: Sähköverkot I ja II. Otatieto Oy.

**Prerequisites:**

BL10A0100 Basics of Electrical Engineering and BL30A0000 Electric circuits attended.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BL30A0500: Introduction to Electrical Drives, 3 cp

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Lasse Laurila

**Year:**

B.Sc. 3

**Period:**

2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

tutkijaopettaja, TkT Lasse Laurila

**Aims:**

Upon completion of the course the student will be able to describe the principles of electric motors and frequency converters and demonstrate and apply general knowledge on electric drives.

**Contents:**

Operation of electromechanical and electromagnetic devices, current vector, torque, cross-field principle, basic operations of asynchronous motor, synchronous motor and DC motor. Control principles. Applications.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Course Materials:**

Luento- ja harjoitusmateriaalit. Pyrhönen, J. Sähkönkäyttötekniikan perusteet – luentomateriaalia. Pyrhönen: Johdatus sähkökoneisiin. Aura, Lauri & Tonteri, Antti J.: Sähkömiehen käsikirja, osa 2, Sähkökoneet.

**Prerequisites:**

Recommended: BL30A0000 Electric Circuits and BL30A0300 Electromagnetism attended.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BL40A2301: Energy Efficiency, 6 cp

**Validity:** 01.08.2013 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Tero Ahonen, Jero Ahola, Tero Kaipia, Antti Kosonen, Lasse Laurila

**Year:**

M.Sc. (Tech.) 1

**Period:**

4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc (Tech.) Jero Ahola, Postdoctoral Researcher, D.Sc (Tech.) Tero Ahonen, different lecturers

**Aims:**

Upon completion of the course the student will be able to: 1. determine actions for the energy efficiency of the energy conversion process, 2. estimate the overall energy efficiency of the energy conversion system, 3. identify applications of electric energy usage and apply methods that can be used to improve the energy efficiency.

**Contents:**

The course provides the student with an introduction to the significance and development potential of energy efficiency in energy production, transmission, distribution and end use. The focus is on electric energy and systems approach. The lecture topics are the efficiency of energy production processes, the efficiency of electricity transmission and distribution and the efficiency of energy end use. The course is arranged as a series of lectures delivered by experts. The lecture topics may vary from year to year.

**Teaching Methods:**

Lectures 12 h, individual home works, demo lectures, examination. Total workload 156 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, examination 100 %, accepted individual home works.

**Course Materials:**

Lecture material, material announced by lecturers.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

## YmKSaEnYmPe: , 20 - 30 cp

**Validity:** 01.08.2016 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Pakolliset opinnot 17 op.*

### BH20A0710: Fundamentals of Thermodynamics, 3 cp

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Tero Tynjälä

**Note:**

Korvaa opintojakson BH20A0700 Teknillisen termodynamiikan perusteet, 2 op.
Kurssin sisältö vastaa kurssin BH20A0750 Teknillinen termodynamiikka 1. periodin sisältöä ja harjoitukset ja luennot ovat yhteiset kurssin BH20A0750 Teknillinen termodynamiikka kanssa.

**Year:**

B.Sc.(Tech) 2

**Period:**

1

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Tero Tynjälä, TkT, dosentti

**Teaching Methods:**

1st period: 12 h of lectures, 12 h of tutorials. 30 h of self study in online learning environment and answering to multiple choice (Quiz) assignments, 21 preparation for the examination, 3 h

examination. Students must complete the compulsory tutorials before taking the examination. Total workload 78 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 60 %, quiz-assignments 40 %.

**Course Materials:**

Online material on Moodle, “Thermodynamic tables” handout, enthalpy and entropy chart for steam. The relevant parts of Moran, M.J. & Shapiro, H.N.: Fundamentals of Engineering Thermodynamics, 5th ed. 2004 or later.

**Number of exercise groups where enrollment is in WebOodi (Number/Leave empty):**

5

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

### BL40A2600: Wind power and solar energy technology and business, 5 cp

**Validity:** 01.08.2013 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Olli Pyrhönen, Katja Hynynen

**Year:**

B.Sc. 3

**Period:**

3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

D.Sc. Katja Hynynen

**Aims:**

Upon completion of the course the student will be able to: 1. model the process from wind energy into company turnover at the principle level, 2. identify and describe the key technologies related to wind power, the core business principles, environmental issues, energy policy and their development trends, 3. describe the mutual effects of wind power and electric power systems, 4. identify and describe the technologies related to solar power., 5. describe the basic principle of photovoltaic cells, 6. estimate the performance and profitability of a PV plant.

**Contents:**

Core content; process modelling from kinetic energy of wind into company turnover and from solar radiation to turnover. Complementary knowledge; basic components of a wind power plant (turbine, gearbox, generator, power electronics, power electronics, tower), environmental effects of wind power, wind park planning, grid effects of wind power, economic feasibility of wind power under different circumstances, wind conditions in Finland. Solar energy technologies, operating principle of solar panels, PV solar power plant structure.

**Teaching Methods:**

Lectures 14 h, homework, 3rd period. Lectures 14 h, 4th period. Weekly homework. Two assignments. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, project works 60 %, homework 40 %.

**Course Materials:**

Material handed out in class. Moodle.

**Prerequisites:**

Basics of physics (mechanics, thermodynamics, electricity)

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BH60A0001: Basic Course in Environmental Technology, 6 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Lassi Linnanen, Risto Soukka, Heli Kasurinen, Helena Kahiluoto, Mirja Mikkilä, Mika Luoranen, Mika Horttanainen

**Note:**

The course will be lectured twice during academic year, in autumn and in spring.
Replaces the course BH60A0000 Ympäristötekniikan perusteet 3 op.

**Year:**

B.Sc. (Tech.) 1

**Period:**

1-2, 3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Mika Horttanainen

**Aims:**

Upon completion of the course the student is expected to be able to
1. list the most important sustainability challenges posed by production and communities,
2. name the most typical ways of controlling sustainability challenges,
3. use environmental engineering terminology,
4. write a seminar report, act as an opponent, and give a seminar presentation,
5. apply life cycle thinking to the management of environmental impacts of product chains, and
6. explain how other technology fields are connected to environmental engineering.

**Contents:**

Sustainability challenges related to production, consumption, gaseous emissions, water use and wastes at different spatial scales. Technical solutions and steering mechanisms for the management of the sustainability challenges.

**Teaching Methods:**

1st –2nd / 3rd-4th period 20 h of lectures. 2nd/4th period project assignment including literature review and seminar presentation (team work) approx. 60 h. 2nd/4th period seminar presentation and sessions 10 h. Homeworks and quizzes approx. 56 h. Total workload 146 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Examination 70 %, written exercise 30 %.

**Course Materials:**

Moodle, handout, lecture materials.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 130

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

*Vaihtoehtoisia opintoja valitaan siten, että sivuopintojen vaadittava minimiopintopistemäärä tulee täyteen tutkinto-ohjelman vaatimusten mukaisesti.*

**BH50A0200: Power Plant Engineering, 4 cp**

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Kari Luostarinen, Esa Vakkilainen, Juha Kaikko

**Year:**

B.Sc. 3

**Period:**

3

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Docent, D.Sc. (Tech.) Juha Kaikko, Professor, D.Sc. (Tech.) Esa Vakkilainen

**Aims:**

Upon completion of the course the students will be able to 1. explain the basic processes of thermal power plants (excl. nuclear energy) and the impact of various factors on process efficiency, 2. apply mass and energy balances into energy production processes, and 3. calculate the operating values of basic power plant processes and the costs of energy production.

**Contents:**

The operation of thermal power plants and power plant processes. Calculation methods of cycle processes. Condensing power plants, back-pressure power plants, heating power plants, gas turbine power plants, combined cycle power plants. Calculation of production costs.

**Teaching Methods:**

3rd period: 12 h of lectures, 6 h of demonstration lectures, 12 h of tutorials. Assignment. Written examination. Tutorials and the assignment must be completed before the examination. Independent study approximately: Assignment 20 h. Preparation for the examination 18 h and the examination 3 h. Studying given material 33 h. Total workload 104 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 80 %, assignment 20 %.

**Course Materials:**

Huhtinen, Markku et al.: Voimalaitostekniikka, Finnish National Board of Education, 2013. Lecture notes.

**Prerequisites:**

BH20A0700 Fundamentals of engineering thermodynamics or BH20A0800 Engineering thermodynamics attended.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 10

**Related to:**

to sustainability

### BH60A1600: Basic Course on Environmental Management and Economics, 5 cp

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Lassi Linnanen, Virgilio Panapanaan, Katariina Koistinen

**Year:**

B.Sc. (Tech.) 2

**Period:**

2

**Teaching Language:**

The course will be lectured in English. The assignments and exam is possible to do in Finnish. If you want to do the course in Finnish, please contact the teacher.

**Teacher(s) in Charge:**

Professor, D.Sc. (Econ. & Bus. Adm.) Lassi Linnanen

**Aims:**

Upon completion of the course the student is expected to be able to:
1) describe the challenges that sustainable development poses to society and businesses;
2) understand how and what environmental responsibility and sustainability means for business;
3) identify corporate stakeholders and analyse their importance and environmental viewpoints;
4) understand the basics of environmental regulations, environmental strategy and risk management;
5) use and compare the indicators of eco-efficiency;
6) explain the basics of life cycle thinking, management and related concepts;
7) explain the steps of planning and implementing environmental management system;
8) know the different environmental communication and marketing tools; and
9) synthesise the basic environmental management tools and explain the reasons for their application.

**Contents:**

Identifying the influence of sustainable development on business. Learning the basic concepts related to corporate responsibility and corporate environmental management. Identifying corporate stakeholders and their importance. Understanding the basics of environmental regulations and the concepts of environmental strategy and risk management. Recognising the indicators of eco-efficiency. Knowing the basics of life cycle analysis and related concepts on environmental product design. Knowing the basics of building and maintaining an environmental management system. Understanding the basics of environmental communication (environmental marketing, eco-labelling and sustainability reporting).

**Teaching Methods:**

2nd period: 24 h of lectures, including two voluntary case exercises (group work). Share of individual work (approx. 106 h). Written assignment, approx. 56 h, written examination and preparation for it, approx. 50 h. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Assessment:**

0 - 5. Examination 70 %, written assignment 20 %, case-exercises 10 %.

**Course Materials:**

Schaltegger et al., 2003. An introduction to corporate environmental management: striving for sustainability.
Werner, A. 2014. Elements of Environmental Management.
Additional reading materials will be provided during the lectures.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 100, priority is given to the students who have this course as an obligatory in their degree structure

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BH61A0000: Fundamentals of Energy Economics, 2 cp

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Aija Kivistö, Tapio Ranta

**Year:**

B.Sc. 1

**Period:**

2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

professori, TkT Tapio Ranta

**Aims:**

Upon completion of the course the student will be able to: 1. apply alternative investment calculation methods in energy investments, 2. calculate the energy contents of fuels in different energy units, 3. describe the fundamentals of energy production methods and the applicable fuel options, 4. describe the grounds for the fuel price determination, and 5. identify the grounds for the security of energy supply.

**Contents:**

Finnish energy economics. Principles of investment calculation methods. Main energy units and heat value of fuels. Energy chain of fuels. Principles and efficiencies of energy production methods. Fuel prices and the effect of emission trading. Maintenance and delivery reliability.

**Teaching Methods:**

2nd period: 12 h of lectures, 6 h of tutorials, homework. Written examination. Total workload 52 h, containing 34 h of self-study.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Examination 80 %, homework 20 %.

**Course Materials:**

Mikko Kara et al.: Energia Suomessa: Tekniikka, talous ja ympäristövaikutukset 2004, chapter 3. Material on Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BL10A0100: Basics of Electric Engineering, 3 cp

**Validity:** 01.08.2007 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Pia Lindh

**Year:**

B.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

tutkijaopettaja, TkT Pia Lindh

**Aims:**

Upon completion of the course the student will be able to: 1. identify the turning points in the history of electrical engineering, 2. list the most essential electric power generation methods, 3. determine the most important end-uses of electricity, 4. describe the fundamentals of electrical safety, 5. explain electricity price formation, 6. identify applications of electrical engineering and describe their operation principles, 7. solve simple DC and AC systems and 8. understands how transformer and generator works.

**Contents:**

Short introduction to the history of electrical engineering. Electricity generation, distribution and use. Electrical safety. Electricity price. Electrical quantities: voltage, current, power, energy. Electrical engineering and electronics applications: e.g. electrical machines, electric vehicle, antenna.

**Teaching Methods:**

Lectures, e-learning and group assignments 28 h 1st-2nd period.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Moodle assignments related to the lectures account for 100 % of the grade. Extra assignments possible.

**Course Materials:**

Course material in the Moodle learning environment. Literature announced at the beginning of the course.

**Places for exchange-students? (Yes, number/No):**

Yes, 3

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

## KoDSaKote: , 20 - 30 cp

**Validity:** 01.08.2012 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Pakolliset opinnot 19 op*

### BK10A3500: Materials, 7 cp

**Validity:** 01.08.2015 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Timo Kärki, Raimo Suoranta

**Year:**

B.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

University Lecturer, Lic. Sc. (Tech.) Raimo Suoranta, Professor, D.Sc. (Tech.), D.Sc. (Agr. & For.) Timo Kärki

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Number of mid-term examinations:**

2

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

*Elective*

**BK10A3500-A: Materials, part A, 4 cp**

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:**
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Timo Kärki, Raimo Suoranta

No course descriptions.

**BK10A3500-B: Materials, part B, 3 cp**

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:**
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Timo Kärki, Raimo Suoranta

No course descriptions.

**BK50A3401: Technical Documentation and 3D-modelling, 6 cp**

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Raimo Suoranta, Kimmo Kerkkänen

**Note:**

Replaces the course BK50A3400 Tekninen dokumentointi ja 3D-mallinnus 5 op.

**Year:**

B.Sc. (Tech.) 1

**Period:**

1-3

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

University Lecturer, Lic. Sc. (Tech.) Raimo Suoranta

**Aims:**

After having passed the course module the student is able to:
- use 3D-modelling software (SolidWorks) in different applications of mechanical engineering and model different geometries
- to utilize the valid standards during the documentation work
- produce tolerance-based dimensioning of a product and explain what different tolerances mean
- use identification symbols of surface roughness in documents and define their meaning
- produce manufacturing documents including welding documents according to valid standards
- produce the technical documents of an assembly, recognize different machine parts and find the critical parts of the assembly to ensure the functioning of the product
- produce and select the best software and presentation style from among different alternatives to model and document a product.

**Contents:**

Basics of standards for technical documentation, data processing and transfer. Rules of drawing and sizing. Process charts of hydraulic systems. Process charts for the most common technical processes Manufacturing documents of a product and symbols and identifications which are used in them (identifications and symbols for tolerances, surface roughness and welding). Manufacturability aspects. Assembly documents. 3D assembly documents. Basics of how to compare CAD software. Basics of CAD/CAM integration. Basics of how to increase the productivity of computer assisted design by utilizing parametric, wizard based and feature based modelling. Basics of product data management (PDM systems, basic facilities of CAE systems). Basics of product visualisation.

**Teaching Methods:**

Lectures 36 h 1.-3. period. Exercises 18 h, 1. period. Teamwork 30 h, 2.-3. period. Project work 40 h and independent work 28 h. Total workload 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, project work 50 %, exercises 50 %.

**Course Materials:**

Course material in Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BK80A2900: Basic Course in Strength of Materials, 3 cp

**Validity:** 01.08.2015 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Heli Mettänen

**Year:**

B.Sc. (Tech.) 2

**Period:**

1

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Heli Mettänen, M.Sc. (Tech.), Doctoral Student

**Aims:**

Basics of the strength of materials and their application to simple parts, structures and pressure vessels.

**Contents:**

Definition of normal and shear stress. Mechanical properties of materials. Separate treatments of axial load, torsion and bending. Transverse shear, shear flow in thin-walled structures. State of stress resulting from combined loadings. Transformation of a multiaxial state of stress. Design of beams and shafts.

**Teaching Methods:**

Lectures 21 h, period 1. Exercises 21 h, period 1. Independent study 36 h. Total workload 78 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, final examination 100 %.

**Course Materials:**

Moodle Hibbeler, R.C., Mechanics of Materials Outinen, H., Koski, J., Salmi, T., Lujuusopin perusteet

**Prerequisites:**

Recommended Mekaniikka- or Mekaniikan perusteet-course

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 1-10

### BK80A3200: Basics of Mechanics, 3 cp

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Kimmo Kerkkänen

**Year:**

B.Sc. (Tech.) 1

**Period:**

1

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

University Lecturer, D.Sc. (Tech.) Kimmo Kerkkänen

**Aims:**

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
- An ability to make difference between a particle and a rigid body
- An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium in 2D.
- An ability to calculate kinematics and kinetics for particles
- An ability to use Newton’s second law and energy and momentum methods for particles

**Contents:**

Equilibrium of Particles in 2-D, Equivalent Systems of Forces, moments, couples, Equilibrium of Rigid Bodies in 2D, Kinematics and Kinetics of Particles. Force and Acceleration, Work and Energy, Impulse and Momentum Methods for Particles. In general: Differential equations and vector algebra.

**Teaching Methods:**

Lectures 21 h, 1st period. Exercises 14 h, 1st period. Additional individual work 43 h, 1st period. Moodle examination. Total workload 78 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Exam 50 %, individual assignments 50 %.

**Course Materials:**

Salmi T., 2001, Statiikka. Hibbeler R.C., Engineering Mechanics, Dynamics, 9th ed. Chapters 12-15. Lecture notes.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 20

*Valitaan seuraavista opintoja siten, että sivuaineopintojen vähimmäisopintopistemäärä täyttyy.*

**BK10A3601: Production Technologies, 11 cp**

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Antti Salminen, Juha Varis, Raimo Suoranta, Mika Lohtander, Timo Kärki, Katriina Mielonen

**Note:**

The course can be done and registered in two parts, 5 ECTS cr and 6 ECTS cr.
Replaces the course BK10A3600 Valmistus- ja tuotantotekniikka 12 op.

**Year:**

B.Sc. (Tech.) 2

**Period:**

3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.), D.Sc. (Agr. & For.) Timo Kärki

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Number of mid-term examinations:**

2

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 5

*Elective*

**BK10A3601-A: Production Technologies, part A, 5 cp**

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:**
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F

No course descriptions.

**BK10A3601-B: Production Technologies, part B, 6 cp**

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:**
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F

No course descriptions.

**BK60A0200: Mechatronics, 6 cp**

**Validity:** 01.08.2007 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Rafael Åman, Heikki Handroos

**Year:**
B.Sc. (Tech.) 3
**Period:**
1-2
**Teaching Language:**
Finnish
**Teacher(s) in Charge:**
Professor, D.Sc. (Tech.) Heikki Handroos
**Examination in Examination schedule (Yes/No):**
Yes
**Examination in Moodle (Yes/No):**
No
**Examination in Exam (Yes/No):**
No
**Number of mid-term examinations:**
2
**Places for exchange-students? (Yes, number/No):**
No
**Places for Open University Students?(Yes, number/No):**
This course has 1-10 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BK65A0203: Engineering Design, 7 cp

**Validity:** 01.08.2015 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Kimmo Kerkkänen, Harri Eskelinen

**Year:**

B.Sc. (Tech.) 2

**Period:**

1-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

University Lecturer, D.Sc. (Tech.) Kimmo Kerkkänen

**Aims:**

Students who successfully complete the course will demonstrate the following outcomes project works, exercises and written reports:
- how to work in a constructive and systematic team
- how to use creative ideation in product development process
- how to apply the methodology of a systematic product planning
- how to work as a member of a product development team
- basics of machine elements and interactions of basic machine elements
- how to select and design basic machine elements for typical applications.

In addition, a student understands basic skills and knowledge required in the design process of a complete construction.

**Contents:**

Fundamentals of a systematic product planning and systematic machine design process, customer needs definition, conceptual design, constructive creation and evaluation of solution variants, evaluation of costs, design principles for manufacturing, safety and reliability, failure-potential evaluation techniques. Digital machine design. Influence of the protection of inventions to product development process, patent applications. Smart materials and composites in engineering constructions. The student will be acquainted with the design and manufacturing of technical product from a practical point of view. Selection and design of basic machine elements, analysis of machine elements under static and dynamic loads.

**Teaching Methods:**

Lectures 42 h, 1st-3rd period. Exercises and seminars 48 h, 1st-4th period. Additional teamwork 66 h, 1st-4th period. Additional individual work 26 h. Total workload 182 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, project works 100%. Evaluation consists of elements such as evaluation of presentations, written documents, peer evaluation etc.

**Course Materials:**

Pahl G. & Beitz W., 1996. Engineering Design: A Systematic Approach, London, Springer. 543 s. Ulrich K.T. & Eppinger S.D. 2000. Product Design and Development. New York, Irwin McGraw-Hill. 358 s. Björk T. et.al., 2014, Koneenosien suunnittelu, 517 s. Mott, R. L., 2013. Machine Elements in Mechanical Design. Niemann G. & Winter H., Maschinenelemente I, II ja III. Lecture notes.

**Prerequisites:**

BK50A3400 Technical documentation and 3D-modelling or BK10A4200 Product Design and Modeling completed, BK80A2600 Mechanics recommended.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-15 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BK80A2601: Mechanics, 7 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Kimmo Kerkkänen, Jussi Sopanen

**Note:**

Replaces the course BK80A2600 Mekaniikka 10 ECTS cr together with course BK80A3200 Mekaniikan perusteet.

**Year:**

B.Sc. (Tech.) 1

**Period:**

2-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Jussi Sopanen
University Lecturer, D.Sc. (Tech.) Kimmo Kerkkänen

**Aims:**

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:
- An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium in 3D.
- An understanding of the analysis of friction forces.
- An ability to use the principle of virtual work
- A knowledge of internal forces and moments in members

- An ability to calculate kinematics and kinetics for rigid bodies
- An ability to use Newton’s second law and energy and momentum methods for rigid bodies
- A knowledge of basics of vibrations

**Contents:**

Equilibrium of Rigid Bodies in 3D, Analysis of Structures: frames and machines, Forces in Beams, Friction, Kinematics and Kinetics of Rigid Bodies. Force and Acceleration, Work and Energy, Impulse and Momentum Methods for Rigid Bodies. Frictionless Eccentric Impact. One Degree of Freedom Harmonic Vibration, Platform Stimulus, Rotating Unbalance. In general: Differential equations and vector algebra, use of mathematical software.

**Teaching Methods:**

Lectures 63 h, 2nd-4th period. Exercises 42 h, 2nd-4th period. Additional individual work 62 h, 2nd-4th period. Project work 15 h, 2nd period. Moodle examination. Total workload 182 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5: Exam 30 %, individual assignments and project works 70 %.

**Course Materials:**

Salmi T., 2001, Statiikka. Hibbeler R.C., Engineering Mechanics, Dynamics, 9th ed. Chapters 16-19, 22. Lecture notes.

**Prerequisites:**

Basics of Mechanics

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 20

### BK80A2701: Strength of Materials, 9 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Heli Mettänen

**Note:**

The course can be done and registered in two parts, 4 ECTS cr and 5 ECTS cr. Final grade will be given, when the whole course is passed.
Replaces the course BK80A2900 Lujuustekniikan perusteet (3 ECTS cr) together with course BK80A2700 Lujuusoppi (12 ECTS cr).

**Year:**

B.Sc. (Tech.) 2

**Period:**

2-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Heli Mettänen, M.Sc. (Tech.), Doctoral Student

**Aims:**

To teach the basics of the strength of materials and the ability to apply the knowledge to simple parts and structures.

**Contents:**

Design of beams and shafts. Deflections of beams and shafts. Buckling of columns. Theories of failure. Basics of fatigue in dynamically loaded shafts. Composite beams. Un-symmetric beam bending. States of stress and strain. Generalized Hooke's law. Behavior of orthotropic materials and laminates. Thick-walled axisymmetric shells. Deformation energy and failure theories. St. Venant's theory for torsion. Prandtl's membrane analogy. Stresses in curved bars. Deformation of circular members. Equilibrium solutions for elastic buckling. Castigliano's theorems. Principle of virtual work. Principle of stationary potential energy.

**Teaching Methods:**

Lectures 63 h, 2nd-4th period. Exercises 63 h, 2nd-4th period. Project work 10 h. Individual work 98 h. Total 234 h

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Number of mid-term examinations:**

2

**Assessment:**

0-5, examination or intermediate examinations 70 %, exercises 30 %.

**Course Materials:**

Lectures in Moodle. Helpful literature: Hibbeler, R.C., Mechanics of Materials. Outinen, H., Koski, J., Salmi, T., Lujuusopin perusteet. Ugural A.C. and Fenster S.K., Advanced Strength and Applied Elasticity, 4th ed. Ugural A.C. Mechanics of Materials. Hibbeler, Structural Analysis. Pennala, Lujuusopin perusteet.

**Prerequisites:**

BK80A2900 Lujuustekniikan perusteet completed.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 1-5

*Elective*

### BK80A2701-A: Strength of Materials, part A, 4 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:**

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

No course descriptions.

### BK80A2701-B: Strength of Materials, part B, 5 cp

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:**
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F

No course descriptions.

## BK80A2800: FE-analysis, Elementary Course, 5 cp

**Validity:** 01.08.2015 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Timo Björk, Ilkka Pöllänen

**Year:**

B.Sc. (Tech.) 3

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Ilkka Pöllänen, M.Sc. (Tech.)
Timo Björk, D.Sc. (Tech.), Professor

**Aims:**

To teach the basics of the FE-analysis and modelling.

**Contents:**

The basic theory of the FE-analysis and modelling.

**Teaching Methods:**

Lectures 28 h, 1st-2nd period. Exercises 28 h, 1st-2nd period. Independent work 74 h. Total 130 h

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, examination 60 %, exercises 40 %.

**Course Materials:**

Lectures in Moodle. Hakala M.K., Lujuusopin elementtimenetelmä.

**Prerequisites:**

BK80A2701 Lujuusoppi completed.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 1-5

## KeSoM300: ?, 21 - 31 cp

**Validity:** 01.01.2017 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Engineering Science
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Kaikille pakolliset opinnot 21 op*

### BJ01A5010: Introduction to Chemical Process Industries, 3 cp

**Validity:** 01.08.2014 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Engineering Science
**Grading:** Study modules 0-5,P/F
**Teachers:** Tuomas Koiranen

**Year:**

B.Sc. (Tech.) 1

**Period:**

INT. 1

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

professori, TkT Tuomas Koiranen

**Aims:**

Upon completion of the module, the student will be able to - describe process industries and its subcategories - nominate and explain some most important production processes in the Finnish chemical industry - tell about the role of process industry in the society and its current trends and future outlook - recognize and describe typical job descriptions of a chemical engineer.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Number of mid-term examinations:**

0

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BJ01A5020: Process and Plant Design, 4 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Engineering Science

**Grading:** Study modules 0-5,P/F

**Teachers:** Ritva Tuunila

**Year:**

B.Sc. (Tech.) 2

**Period:**

4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Associate professor, D.Sc. (Tech.) Ritva Tuunila

**Aims:**

After the module the student can - name and explain most common steps of process and plant design - use the most common methods of process and plant design - read and compile basic documents of process design (process flowsheets, equipment definitions, drawings and equipment lists) - perform process calculations, especially mass and energy balances - estimate cost and profitability of the process.

**Contents:**

Initial information of design. Fundamentals, methodology, steps and content of process design. Process synthesis and analysis. Process flowsheets. Equipment design. Bsis of material selection and corrosion. Layout design. Cost and profitability calculations. Project work./Updated 16.5.17/ml

**Teaching Methods:**

Lectures, seminars and exercises 28 h, 4th period..Group work 30 h, self-study 46 h. Total work load 104 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Number of mid-term examinations:**

0

**Assessment:**

0-5, home assignments 75 %, group work 25 %.

**Course Materials:**

Coulson J.M. et al. Chemical Engineering, Vol 6 (selected chapters).

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BJ01A5030: Introduction to Process Simulation, 4 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Engineering Science

**Grading:** Study modules 0-5,P/F

**Teachers:** Ritva Tuunila

**Year:**

B.Sc. 3

**Period:**

2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

tutkijaopettaja, TkT Ritva Tuunila

**Aims:**

After a module a student can - explain basics and most common applications of process simulation - draw a simulation (information) flowsheet of the process – analyze a process from process simulation point of view - simulate simple chemical processes with a commercial simulator.

**Contents:**

Fundamentals and use of process simulation. Simulation flowsheet. Steady-state simulation. Structure of commercial simulation software. Calculations of mass and energy balances of chemical processes by using commercial simulation software (Aspen Plus).

**Teaching Methods:**

Lectures and exercises 30 h, 2nd period. Simulation assignment 40 h, 2nd period. Self Study 34 h. Total workload 104 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Number of mid-term examinations:**

0

**Assessment:**

0-5, evaluated home assignments 50%, simulation assignment 50%.

**Course Materials:**

Lecture notes and other material informed in the lectures.

**Prerequisites:**

BJ01A4010 Mechanical Unit Operations and BJ01A4030 Design of Unit Operations attended

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BJ01A5040: Process Safety, 2 cp

**Validity:** 01.08.2014 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Engineering Science

**Grading:** Study modules 0-5,P/F

**Teachers:** Maaret Paakkunainen

**Year:**

B.Sc. (Tech.) 2

**Period:**

4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

tutkijatohtori, TkT Maaret Paakkunainen

**Aims:**

Upon completion of the module, the student will be able to - explain the concepts of process safety, risk and intrinsic safety - describe the main principles to minimize safety risks - apply some conventional risk evaluation methods in process design (hazop, chemical matrix, safety indices...) - explain most important legislation concerning chemical safety - explain the preconditions for fires and explosions - explain the ATEX classification - explain the main principles of environmental and occupational safety.

**Contents:**

The concepts of process safety and risk. Chemical safety. Fires and explosions. ATEX directive. Equipment and piping failures. Environmental safety and risks. Occupational safety. WILL BE UPDATED SOON/ml

**Teaching Methods:**

Lectures 14 h, Period 4. Self-study 38 h. Total workload 52 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Number of mid-term examinations:**

0

**Assessment:**

0-5, written exam 70%, assignments 30%.

**Course Materials:**

Lecture notes.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BJ01A5051: Biorefineries, 3 cp

**Validity:** 01.01.2017 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Engineering Science
**Grading:** Study modules 0-5,P/F
**Teachers:** Eeva Jernström

**Note:**

Replaces the course BJ01A5050 Biojalostamot, 2 ECTS

**Year:**

B.Sc. (Tech.) 1

**Period:**

2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Associate professor, D.Sc. (Tech.) Eeva Jernström

**Aims:**

After completition of the module, the student will know: - Biorefinery as a framework and the most essential biorefinery concepts - The role and importance the biorefineries for forest industry and the related industry: economical, technological and societal challenges - The most essential biorefinery products, their raw materials and the most common production processes, emphasis on new and future products And be able to - Describe and assess the usability of bio-based raw materials for hte production of biorefinery products - Assess the functionality of different biorefinery products and the related challenges - Describe ad assess typical production processes of various biorefinery products and the related challenges from different angles.

**Contents:**

Current biorefineries, wood resources as raw material for biorefineries, other than wood-based raw material for biorefineries, most typical biorefinery concepts, new integrated pulp

and biorefineries, side stream to be used, potential new products and their most essential production processes, biorefineries in the context of bio-economy.

**Teaching Methods:**

Lectures, videos, material in the net, individual or group assignments combined with independent studying.
Weekly Moodle exams or an electronic exam after the course.
- Lectures: 12 h, 6 x 2h
- individual assignments at Moodle: 18 h
- preparation for weekly exams, independent study, materials at Moodle: 42 h, 6 x 7 h
- weekly exams at Moodle: 6 h, 6 x 1 h.
Total workload 78 h./Updated 15.5.17/ml

**Examination in Exam (Yes/No):**

Yes

**Assessment:**

Pass/fail. Particpation to lecturers: 80 % mandatory combined either with approved weekly exams and assignment done and approved or with assignment done and approved written examination after the course.

**Course Materials:**

Lecturers and related material.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

### BJ02A2061: Product Design, 5 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Engineering Science
**Grading:** Study modules 0-5,P/F
**Teachers:** Arto Laari

**Year:**

M.Sc. (Tech.) 2

**Period:**

1

**Teaching Language:**

English

**Teacher(s) in Charge:**

Docent, D.Sc. (Tech.) Arto Laari

**Aims:**

Upon completion of the module, the student will be able to: - nominate and classify chemical products - analyze customers's needs - create and develop ideas for chemical products - compare product ideas and make selections - apply his/hers chemical engineering knowledge in product design - evaluate product costs and profitability.

**Contents:**

Teaching includes lectures and guided product design work. Students will carry out a product design project in design groups.

**Teaching Methods:**

Lectures, exercises and seminars 28 h. 1st period. Self-study and project work 102 h. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Number of mid-term examinations:**

0

**Assessment:**

0-5, project work 100%.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

*Vapaavalintaiset opinnot 5-10 op*

**BJ02A2051: Process Intensification, 5 cp**

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Engineering Science
**Grading:** Study modules 0-5,P/F
**Teachers:** Arto Laari

**Year:**

M.Sc. (Tech.) 1

**Period:**

4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Docent, D.Sc. (Tech.) Arto Laari

**Aims:**

Upon completion of the module, the student will be able to
- explain the goals of process intensification, describe advantages reached by it as well as typical methods of intensification
- explain and use the following applications of process intensification: intensified reactors and separation equipment, combination of reaction and separation, hybrid separation, alternative energy sources, transforming a batch process to continuous one
- recognize possibilities to intensify and apply novel technology in existing processes.

**Contents:**

Teaching will include lectures, seminars and exercises. In the seminars and exercises there will be discussion and problem solving about various topics and problems given by the lecturer.

**Teaching Methods:**

Lectures, seminars and exercises 28 h, 4th period. Self-study and preparation for seminars 102 h. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Assessment:**

0-5, written examination 50%, seminar report and exercises 50%.

**Places for exchange-students? (Yes, number/No):**

Yes, 15 places for exchange students.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BJ02A4051: Development of New Sustainable Products and Solutions, 5 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Engineering Science

**Grading:** Study modules 0-5,P/F

**Teachers:** Katriina Mielonen, Sami-Seppo Ovaska

**Note:**

Replaces the course BJ02A4050 Biomaterials Design and Application
Suitable also for doctoral studies

**Year:**

M.Sc. (Tech.) 1

**Period:**

3

**Teaching Language:**

English

**Teacher(s) in Charge:**

D.Sc. (Tech.) Katriina Mielonen/Edited 27.6.17/ml

**Aims:**

To give an overview about the use of modern biochemicals such as nanocellulose, hemicellulose lignin in various applications.
After the completing the module, the student ought to:
- describe how various renewable resources is utilized in various applications.
- have an insight into material and molecular design and its role for the end product performance
- describe how biomaterials, and in particular wood derived, are used for example in food, pharmaceuticals, composites, and smart materials.

**Contents:**

Use of fibers, cellulose (derivatives), lignin in various non-paper applications. Fundamentals about biomaterial design, modification, synthesis and use in various products.. Chemical and mechanical modification, separation methods, mixing and drying methods. Product specification requirements and characterization methods.

**Teaching Methods:**

Lectures 28h Self studies 42h Project work 30h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

Yes

**Number of mid-term examinations:**

0

**Assessment:**

0-5. 70% written examination 30% project work.

**Course Materials:**

Lecture material will be distributed via Moodle.

**Prerequisites:**

BJ02A4040 Processing of biomaterials

**Places for exchange-students? (Yes, number/No):**

Yes, 5

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

## TikSOTite: Computer Science, 24 - 30 cp

**Validity:** 01.08.2017 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Vaihtoehtoiset (väh. 24 op). Jos opintojakso sisältyy esim. pakollisiin ydinopintoihin, valitaan muuta tilalle. Suositeltu suoritusjärjestys alla. Huomioi esitietovaatimukset!*

### LM10A2000: Introduction to Information Systems, 3 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Uolevi Nikula

**Year:**

B.Sc. (Tech.) 1, B.Sc. (Econ. & Bus. Adm.) 1

**Period:**

2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Uolevi Nikula

**Aims:**

The student understands the role of information systems in an organization, how e-commerce is based on information systems, and what are the typical characteristics of information systems development projects.

**Contents:**

The course consists of lectures presenting different information systems (IS) and their typical characteristics. For example, the LUT IS related to the studies will be explained from different viewpoints including the architecture, information security, and studying; in more general the role of data security, privacy and usability in IS; running a IS project from the IS vendor point of view; and the how e-commerce can be organized based on IS.

**Teaching Methods:**

Lectures 14 h, independent study and reflection diary on a weekly basis 64 h, total 78 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, based on weekly assignments.

**Course Materials:**

Course materials will be provided in the lectures.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

### CT60A0201: Introduction to Programming, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Uolevi Nikula

**Note:**

This course is given only in Finnish and thus it is not suitable for students who do not understand Finnish properly.

**Year:**

B.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

tutkijaopettaja, TkT Uolevi Nikula

**Aims:**

Student can explain the basic programming constructs and concepts, and can make small programs with an imperative programming language.

**Contents:**

Basic programming concepts and constructs; fundamentals of program and algorithm design and testing; good programming style. Programming with the Python-language.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Intermediate tests or exam 50 %, assignments and programming project 50 %.

**Course Materials:**

The LUT Python programming manual, lecture material, other material announced on lectures.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

### CT60A0220: Principles of C-Programming and Testing, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Uolevi Nikula

**Year:**

B.Sc. (Tech.) 1

**Period:**

3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Associate Professor, D.Sc. (Tech.) Uolevi Nikula

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### CT30A2802: User Interfaces and User-Centric Desing, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Kari Heikkinen

**Year:**

B.Sc. (Tech.) 1

**Period:**

3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

D.Sc. (Tech.) Kari Heikkinen

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### BM40A0301: Data Structures and Algorithms, 6 cp

**Validity:** 01.01.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Engineering Science

**Grading:** Study modules 0-5,P/F

**Teachers:** Heikki Kälviäinen, Tuomas Eerola

**Note:**

Replaces the course BM40A0300

**Year:**

B.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Heikki Kälviäinen

**Aims:**

After the course a student is expected to be able to explain the complexity categories of algorithms and their related data structures, to estimate the complexity category of a given algorithm, to select a suitable design principle of algorithms to solve a problem, to write an algorithm using advanced data structures, and to implement it using the C language.

**Contents:**

Algorithmic solutions and data structures. Complexity categories. NP-complete problems. Algorithmic notation. Analysis methods. Design principles of algorithms and their relevant data structures. Typical problems and their data structures: sorting, search and network problems, and stacks, lists, trees and graphs. Approximation and random algorithms. Implementations using the C language.

**Teaching Methods:**

Lectures and exercises 28 h, homework etc. self-studying 35 h, 1st. period. Lectures and exercises 28 h, homework etc. self-studying 35 h, 2nd period. Practical assignment 30 h. Total amount 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 – 5, exercises 100 %. Practical assignment.

**Course Materials:**

Material announced in the course web page.

**Prerequisites:**

CT60A0210 Käytännön ohjelmointi or CT60A0220 C-ohjelmoinnin ja testauksen perusteet, recommended BM40A0101 Tietojenkäsittelyn
perusteet.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

### CT60A2411: Object-Oriented Programming, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Uolevi Nikula, Jiri Musto

**Year:**

B.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Associate Professor, D.Sc. (Tech.) Uolevi Nikula

**Aims:**

Student learns to use object-oriented programming methods to solve typical programming problems and familiarizes himself with Java and its features in programming. Student knows how to read and describe Java code and UML diagrams. Student understand version control and designing of graphical user interface.

**Contents:**

Object-orientation, classes, inheritance, basics of modelling classes, principles of Java, basic data structures, abstract data types, exceptions, graphical user-interface.

**Teaching Methods:**

Lectures 2 h, videos 8 h, exercises 14 h, practical assignment 16 h, independent work 30 h 1st period. Videos 8 h, exercises 14 h, practical assignment 30 h, independent work 30 h 2nd period. Traininffor the exam and exam 8 h. Total amount of work 160 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 – 5. Exam 30%, exercises 25%, practical assignment 45%

**Course Materials:**

Lecture slides, supplementary material e.g. Bruce Eckel, Thinking in Java Other material announced in the lectures.

**Prerequisites:**

CT60A0210 Käytännön ohjelmointi.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 15- places for open university students. More information on the web site for open university instructions.

**CT60A4303: Introduction to databases, 3 cp**

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Antti Knutas

**Note:**

This course can't be included into a same degree as CT60A4302 Tietokannat.

**Year:**

B.Sc. (Tech.) 2

**Period:**

3

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Postdoctoral researcher, D.Sc. (Tech.) Antti Knutas

**Aims:**

Give the student basic knowledge on how to design and model a relational database. The student will learn to understand object database design process and modeling. The students learn to understand databases at a conceptual level, and to design databases for different operating environments. The student will learn the basics of SQL and embedding SQL to applications.

**Contents:**

Database systems. Database design. Object-centric modeling and ER-modeling. Specifying relation models. SQL and object languages.
Perspectives into database design: How database is designed, how information is modeled, and what are information storage structures and access methods.
Transforming ER models to relation model, and then to relation databases. The use of different file formats in different environments. Perspectives to database programming: queries and other operations, database management, e.g. tiggers. Implementing databases in practice and how to use SQL databases from other programs.

**Teaching Methods:**

Online lectures ja -exercises 13 h, exercises 12 h, SQL-online course 20 h 3. periodi.
Project 22 h, 3. periodi. Preparing for exam 10h and online exam 2 h.
All 78 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 – 5. Online exam 20%, project 40%, SQL online course and weekly exercises 40%

**Course Materials:**

Beynon-Davies, P.: Database Systems, Palgrave Macmillan, Third Edition, 2004. Foster, Elvis, C.: Database Systems A Pragmatic Approach, Apress, 2014.
Course material.

**Prerequisites:**

CT60A0200 Ohjelmoinnin perusteet

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, 5

### CT60A7650: Database Systems Management, 3 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ajantha Dahanayake

**Year:**

B.Sc. (Tech.) 2

**Period:**

4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, PhD Ajantha Dahanayake

**Aims:**

At the end of the course students have an understanding of the main challenges and techniques in the design, implementation, and administration of a database management system. Students gain the understanding of concepts and principles underlying the functioning of database management systems as well as their implementation and maintenance.

**Contents:**

Relational model and relational database design, Introduction to relational Algebra. Database applications, data distribution and architectures. Data storage and retrieval, data scalability, performance, security, authorization. Modeling and programing for semi-structured data, secondary storage management.

**Teaching Methods:**

Lectures 14 h, homework work 20 h, 4. period.
Individual assignments, hands on team project assignment 44 h. Total 78 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Individual assignments = 60%. Project Assignment = 40%

**Course Materials:**

A. Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom: Database Systems : The Complete Book, Pearson Prentice Hall 2nd Edition, 2009

**Prerequisites:**

CT60A4303 Tietokantojen perusteet required;

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

Yes, 5

### CT60A4002: Software Engineering, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ossi Taipale

**Year:**

B.Sc. (Tech.) 2

**Period:**

3-4

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Docent, D.Sc. (Tech.) Ossi Taipale

**Aims:**

After the course the student can explain the basic software engineering concepts, the role of different topic areas in software projects, and participate in software projects in different roles utilizing the fundamental software engineering methods and techniques.

**Contents:**

Software engineering process, phases, and their contents. The fundamental methods and techniques in software engineering.

**Teaching Methods:**

Lectures 14 h, self-study 11 h, working on compulsory assignments and a project 41 h, 3. period. Lectures 14 h, self-study 11 h, working on compulsory assignments and a project 52 h, 4. Period. Preparation for 10 h and exam 3 h. Total amount 156 h.

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 – 5. Exam 50 %, exercises, practical assignment and activity 50 %.

**Course Materials:**

Haikala & Mikkonen: Ohjelmistotuotannon käytännöt, 12. painos, Talentum, 2011. Other material announced on lectures.

**Prerequisites:**

CT60A0200 Ohjelmoinnin perusteet.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### LM10A1000: Project Management, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Sami Jantunen

**Year:**

B.Sc. (Tech.) 2, B.Sc. (Econ. & Bus. Adm.) 2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Associate Professor, D.Sc. (Tech.) Sami Jantunen

**Aims:**

Upon completion of the course, students are familiarized with the basic project management concepts and approaches.
Students understand organizational influences on project management and are able to plan, execute and control projects in practice as well as collaborate with stakeholders.

**Contents:**

Project planning, Project execution, monitoring and control. Project quality management.
Project human resource management and collaboration within projects. Special characteristics of software projects.

**Teaching Methods:**

Lectures 14 h, preparation for lectures 14 h, assignments 40 h, 3. period.
Lectures 14 h, preparation for lectures 14 h, assignments and project management exercise 50 h, 4. periodi.
Preparation for examination 7 h and examination 3 h. The total workload for student 156 h.

**Assessment:**

0 - 5, examination 50 %, mandatory assignments and project exercise 50 %.

**Course Materials:**

The material announced in the lectures

**Prerequisites:**

Introduction to Studies of Industrial Engineering/Economic Science/Software Engineering.

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### CT30A3202: Webbed Applications, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Antti Knutas

**Year:**

B.Sc. (Tech.) 3

**Period:**

1-2

**Teaching Language:**

Finnish

**Teacher(s) in Charge:**

Postdoctoral researcher, D.Sc. (Tech.) Antti Knutas

**Aims:**

To familiarize the student with WWW related technologies, standards and tools. The course gives the student the knowledge to design and develop WWW based applications.

**Contents:**

Architectures and standards of WWW applications. Programming languages and interfaces used in client server side programming (e.g. JavaScript, PHP and Ajax). Databases and RSS in WWW applications.

**Teaching Methods:**

Lectures 2 h, exercises 14 h, homeworks, 1. period. Exercises 14 h, homeworks, 2. period. Demonstrations 4 h, 2. period. Virtual assignments, exercise work and assignment, 1.-2. period. Total 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Practical assignment 70%. Continuous evaluation (homeworks and quizzes) 30 %.

**Course Materials:**

Material announced on course web page.

**Prerequisites:**

CT60A0200 Ohjelmoinnin perusteet. Recommended CT60A4301 Tietokannat.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

## BM40A0300: Data Structures and Algorithms, 5 cp

**Validity:** 01.08.2014 - 31.12.2016
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Engineering Science
**Grading:** Study modules 0-5,P/F
**Teachers:** Leena Ikonen

**Aims:**
After the course a student is expected to be able to explain the complexity categories of algorithms and their related data structures, to estimate the complexity category of a given algorithm, to select a suitable design principle of algorithms to solve a problem, to write an algorithm using advanced data structures, and to implement it using the C language.
**Contents:**
Algorithmic solutions and data structures. Complexity categories. NP-complete problems. Algorithmic notation. Analysis methods. Design principles of algorithms and their relevant data structures. Typical problems and their data structures: sorting, search and network problems, and stacks, lists, trees and graphs. Approximation and random algorithms. Implementations using the C language.
**Teaching Methods:**
Lectures and exercises 35 h, homework and practical assignment 48 h, self-studying of taught matters and relevant literature, preparation for the exam 44 h, 2nd period. Exam 3 h. Total amount 130 h. Moodle is used in this course.
**Assessment:**
0 - 5. Exam 50 %, exercises 50 %. Practical assignment.
**Course Materials:**
Material announced in the course web page.
**Prerequisites:**
CT60A0210 Käytännön ohjelmointi, recommended BM40A0100 Tietojenkäsittelyn perusteet.

## BH20A0750: Engineering Thermodynamics, 6 cp

**Validity:** 01.08.2017 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Tero Tynjälä

**Note:**
Kurssin 1. periodin harjoitukset ja luennot ovat yhteiset kurssin BH20A0710 Termodynamiikan perusteet kanssa.
**Year:**
B.Sc. (Tech) 2
**Period:**
1-2
**Teaching Language:**
Finnish
**Teacher(s) in Charge:**
Tero Tynjälä, TkT, dosentti
**Teaching Methods:**

1st period: 12 h of lectures, 12 h of tutorials. 30 h of self study in online learning environment and answering to multiple choice (Quiz) assignments, 21 preparation for the mid-term examination, 3 h of mid-term examination. 2nd period: 12 h of lectures, 12 h of tutorials. 30 h of self study in online learning environment and answering to multiple choice (Quiz) assignments, 21 h of practicing for the assignments and preparation for the mid-term examination, 3 h of mid-term examination. Students must complete the compulsory tutorials before taking the examination. Total workload 156 h.

**Examination in Examination schedule (Yes/No):**
Yes

**Examination in Moodle (Yes/No):**
No

**Examination in Exam (Yes/No):**
No

**Number of mid-term examinations:**
2

**Assessment:**
0 - 5. Examination 60 %, quiz-assignments 40 %.

**Course Materials:**
Online material on Moodle, “Thermodynamic tables” handout, enthalpy and entropy chart for steam. The relevant parts of Moran, M.J. & Shapiro, H.N.: Fundamentals of Engineering Thermodynamics, 5th ed. 2004 or later.

**Number of exercise groups where enrollment is in WebOodi (Number/Leave empty):**
5

**Places for exchange-students? (Yes, number/No):**
No

**Places for Open University Students?(Yes, number/No):**
This course has 1-15 places for open university students. More information on the web site for open university instructions.

## CS30A7390SS: Inventive Product Design and Advanced TRIZ, 3 cp

**Validity:** 01.08.2015 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Leonid Chechurin

**Note:**
The course topics are related to sustainable development.
The course is proposed to be suitable also for doctoral studies.

**Year:**
M.Sc. 1-2

**LUT Summer School time:**
24.-28.7.2017

**Teaching Language:**
English

**Teacher(s) in Charge:**
Professor Leonid Chechurin, LUT

**Aims:**
The aim of the course is to introduce the students to the wide range of existing Design Methods with a focus on Design Creativity and Innovation.
The participants will gain both theoretical competences and practical skills, from the descriptive models for analysing Design processes and behaviours, to the prescriptive tools that provide a structured and multi-disciplinary approach to design.
The course will also allow experiencing the application of exemplary Design tools within a collaborative design contest.

**Contents:**

Overall, lectures, tutorials and team-working sessions will develop a comprehensive overview of the aims and scopes of Design
Methods, providing the students with theoretical and practical aspects on:
- a general framework of design for innovation;
- the main classification schemes of Design approaches;
- cognitive studies on designing;
- design creativity and its influential factors;
- current and future challenges of Design Methods;
- how to build an exhaustive design specification;
- how to stimulate idea generation;
- how to select the most suitable design concept among several ones.

The course is proposed to be suitable also for doctoral studies.
**Teaching Methods:**
- Introductory lectures and exercises 24 hours
- Team work and a limited project work 20 hours
- Presentations of the results of the team work/ project work 8 hours
- Independent work, reading 26 hours

Total workload 78 hours

The course will consist of lectures, tutorials and team-working sessions:

- The lectures, typically scheduled in the morning sessions, will develop a general framework of methods enhancing design creativity, their purposes and key characteristics; different points of views and approaches will provide all the fundamentals and criteria to orient the students for assimilating a structured approach to design according to their personal attitude and expectations.
- Tutorials will propose practical examples of specific tools and techniques suitable to guide the main design phases of analysis, synthesis, and choice. More in details, the tutorials will focus on the analysis of product and service requirements for a proper organization of the design tasks; on the generation of conceptual solutions with the support of inventive heuristics; on the assessment of the proposed concepts and the choice of the preferred solution.
- The afternoon sessions will be dedicated to team working activity on a practical design task, so as to enable the students to work on a product-service system project: the teams will be involved in a multi-disciplinary design contest, where students will experience the complex dynamics of concurrent engineering. An ex-post plenary session will wrap up the main lessons learned within the team working activity, highlighting how the proposed design tools should or should not be used.

**Suitability for doctoral studies (Yes/Leave empty):**
Yes
**Assessment:**
Final grade 0-5:

- Attendance 20%
- Active Participation to team working activities 30%
- Presentation of project outcomes (assignment)  50%

**Course Materials:**
Hand outs of lecture notes, internet resources in open access (given); selection of papers (given).
**Prerequisites:**
Preferably, students of engineering major with Bachelor’s degree or M. Sc. in non-technical studies. Basic definitions and tools of
inventive thinking are needed (TRIZ).

## KoDSaManu: Modern Manufacturing, 20 - 30 cp

**Validity:** 01.08.2016 -

**Form of study:**

**Type:** Study module

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

No course descriptions.

*Obligatory Studies 25 ECTS cr*

**BK50A4000: Production Processes in Modern Job Shops, 5 cp**

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Juho Ratava, Mika Lohtander

**Year:**

M.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Researcher, D.Sc. (Tech.) Mika Lohtander

**Aims:**

After completing the course, the students:
1. can choose the manufacturing processes for the most common products
2. are able to design a manufacturing order for a modern product
3. are able to evaluate manufacturing time and manufacturing costs based on basic mathematics.

**Contents:**

The course focuses production processes, material handling and storage methods needed in modern job shops. During the course, students become familiar with the basic metal industry processes as well as manual and automatic assembly processes. Individual works allows students to familiarize themselves to different kind of manufacturing processes. Students presents case-tasks to other students.

**Teaching Methods:**

Lectures 24 h, lecture exercises and week works 12 h. Independent work 94 h. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, activity during course 33 %, learning diary 34 %, lecture exercises 33 %.

**Course Materials:**

Literature to be announced during lectures. Course material is available in the Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

### BK50A4100: Manufacturing Systems and Scheduling, 5 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Mika Lohtander, Esko Niemi

**Year:**

M.Sc. (Tech.) 1

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Reseacrher, D.Sc. (Tech.) Mika Lohtander

**Aims:**

After completing the course, the student:
1. is able to evaluate the most important production parameters like lead time and bottlenecks by means of simulation
2. is able to design fundamentals of the manufacturing systems
3. is able to evaluate manufacturing time and manufacturing costs based on manufacturing simulation

**Contents:**

The course focus on production management and analysis methods needed in modern job shops. Production was analyzed by computational methods and manufacturing simulation is introduced and some case studies will analyzed. Example tasks are calculated and discussed in small groups. Every lecture includes its own exercise.

**Teaching Methods:**

Lectures 24 h, lecture exercise 24 h. Individual work 82 h. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, activity during course 50 %, individual work 50 %.

**Course Materials:**

Literature to be announced during lectures. Course material is available in the Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

**BK50A4200: Product Flow in Job Shops, 5 cp**

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Mika Lohtander

**Lectured every other academic year (Yes, next realization year/Leave empty):**

Yes, lecturing every socond year, next time in period 1. and 2. in year 2018.

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Researcher, D.Sc. (Tech.) Mika Lohtander

**Aims:**

After having passed the course, the student will:
1. know the the factory management duty and responsibility
2. is able to take responsibility for the daily operations of a production plant
3. know the stakeholders role for production

**Contents:**

The course lectures will discuss the meaning of overall function of manufacturing and stakeholder’s point of view. The topics cover everyday information technology, stakeholder cooperation and internal operation of the plant. A personal work will dealt more in-depth point of view to management.

**Teaching Methods:**

Lectures 24 h, individual work 106 h. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, learning diary 50 %, individual work 50 %.

**Course Materials:**

Literature to be announced during lectures. Course material is available in the Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

**BK50A4300: Managing Job Shops, 5 cp**

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Energy Systems
**Grading:** Study modules 0-5,P/F
**Teachers:** Mika Lohtander

**Note:**

The course will be lectured for the first time during the academic year 2017-2018.

**Lectured every other academic year (Yes, next realization year/Leave empty):**

Yes, 2017-2018.

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Researcher, D.Sc. (Tech.) Mika Lohtander

**Aims:**

After having passed the course, the student will:
1. know the factory management duty and responsibility
2. is able to take responsibility for the daily operations of a production plant
3. know the stakeholders role for production

**Contents:**

The course lectures will discuss the meaning of overall function of manufacturing and stakeholder’s point of view. The topics cover everyday information technology, stakeholder cooperation and internal operation of the plant. A personal work will dealt more in-depth point of view to management.

**Teaching Methods:**

Lectures 24 h, individual work 106 h. Total workload 130 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, learning diary 50 %, individual work 50 %.

**Course Materials:**

Literature to be announced during lectures. Course material is available in the Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

No

### BK50A4401: Fabrication Laboratory, 5 - 10 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Energy Systems

**Grading:** Study modules 0-5,P/F

**Teachers:** Mika Lohtander

**Note:**

Replaces the course 50A4400 Fabrication Laboratory 5 ECTS cr.
Suitable also for doctoral studies.

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

1-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Researcher, D.Sc. (Tech.) Mika Lohtander

**Aims:**

After having passed the course, the student will:
1. get touch some important research topics in field of manufacturing
2. be familiar how to transfer research result to practice
3. is capable to create or build simple and practical solutions.

**Contents:**

The course lectures will discuss the annually changing research themes. During the course the students will built and program simple modern production equipment prototypes. Students will present their Project Work results to public audience.

**Teaching Methods:**

Lectures 12 h, project work 118 h. Total workload 130 h.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, practical part of project work 50 %, theoretical part of project work 50 %.

**Course Materials:**

Literature to be announced during lectures. Course material is available in the Moodle.

**Places for exchange-students? (Yes, number/No):**

No

**Places for Open University Students?(Yes, number/No):**

Yes, this course have 1-5 places for open university students. More information on the web site for Open University instructions.

## TiDSOSE: Software Engineering, 24 - 30 cp

**Validity:** 01.08.2017 -
**Form of study:**
**Type:** Study module
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F

No course descriptions.

*Obligatory courses 18 ECTS cr*

### CT10A7002: Green IT and Sustainable Computing, 6 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Jari Porras

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Jari Porras

**Aims:**

After the course students are familiar with technologies for Green IT and sustainable computing. Students know critical thinking and argumentation principles and are able to apply these skills in discussions carried over the topic. Students are able to discuss about the topic and examine it critically.

**Contents:**

The course emphasizes Green IT and sustainable computing field in sustainable development. The topic is covered through books and scientific articles. Students may be divided into small groups that will each study the topic.

**Teaching Methods:**

Lectures 2 h, seminars and discussions 8 h, homeworks 16 h, self-study 24 h, 3. period.
Seminars and discussions 20 h, homeworks 26 h, self-study 60 h, 4. period. Total 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Seminar work(s), active participation in discussions, homeworks.

**Course Materials:**

To be announced in Moodle pages before the course.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 36. Priority is given to Software Engineering students.

**Places for exchange-students? (Yes, number/No):**

Yes, 5

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Related to:**

to sustainability

### CT60A5102: Models and Methods of Software Engineering, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ahmed Seffah

**Year:**

M.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, Ph.D., PEng. HDR. Ahmed Seffah

**Aims:**

The course covers the main software engineering methods including object-oriented, agile, formal as well as traditional approaches. At the end of this course, the students should be able to:
1. Understand and select the appropriate method or methods for the software development project at hand and for the various types of software systems such as critical-safety systems, interactive consumer services, enterprise applications, hardware software, etc.
2. Master the importance of modeling techniques in software engineering and the diverse types of models. Students should be able to explain the concepts of models, meta-models, platforms dependent and independent models, model-to-model transformations, automated code generation from models.
3. Manage, plan, analyze and contribute to the requirements, design, implementation and maintenance of large software products.
4. Understand how human, social and technical factors may have both positive and negative influences on software engineering methods and practices.
5. Identify the challenges facing the software engineering research community as well as the avenues for further investigations.

**Contents:**

Software Engineering Body of Knowledge (SWEBOK). Principles and foundations of software engineering. Agile software development. Formal methods. Prototyping techniques. Object-oriented design and analysis. Data-centric methods. Model-driven architecture (MDA). Modeling techniques. Importance of modeling in software development projects. Software engineering tools. Information, structure and behavioral modeling. Systematic literature review and large case studies on specific models and methods, their uses and abuses such as UML, use cases, user task-based prototypes, Z, B, G-Express and BPMN (Business Process Modeling Notation).

**Teaching Methods:**

Lectures/seminars on selected topics 24h. Presentations 8h, weekly self-study 48 h (mandatory readings), scientific literature review and case studies 56 h, period 1-2. Research papers 20 h. Total 156 h. The course is designed to be a forum for a scientific discussion and presentations by the professor, students and guests' researchers. Except an introductory lecture, the professor will be mainly acting as a senior project manager and a researcher advising students regarding literature review, reliable information sources on software engineering as well as how to select, review and present a case study on software engineering methods. The students will have to work in a team of 2-3; each team will make 2 presentations in class; each student will have to contribute to the writing of a research paper that can be submitted to a conference or a workshop. Altogether, the presentations provide a systematic framework for selecting the appropriate methods for complex software systems development projects.

**Suitability for doctoral studies (Yes/Leave empty):**

Yes

**Examination in Examination schedule (Yes/No):**

Yes

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Research assignment (60%); research paper (40%) and presentation in class (10%).

**Course Materials:**

There is no book that covers all the topics addressed in the course. A selection of readings from top journals will be used as basic readings; students are requested to make their own literature review. IEEEE Transactions on Software Engineering IEEE Software ACM Transactions on Software Engineering Methodologies Journal of Software and Systems (JSS) Communication of the ACM The students are encouraged to walkthrough, one of the two following books as a basic introductory reading: R.S Pressman. Software Engineering: A Practitioner's Approach, 7/e, McGraw Hill, 2010 J. Sommerville. Software Engineering. 9/e, Addison Wesley, 2011

**Prerequisites:**

CT60A4001 Ohjelmistotuotanto

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 48

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

This course has 1-10 places for open university students. More information on the web site for open university instructions.

### CT60A5300: Software Projects, Processes and Entrepreneurship, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Timo Pihkala, Uolevi Nikula, Marita Rautiainen, Suvi Konsti-Laakso

**Year:**

M.Sc. (Tech.) 1

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Associate Professor, D.Sc. (Tech.) Uolevi Nikula
Professor, D.Sc. (Econ. & Bus. Adm.) Timo Pihkala

**Aims:**

The course establishes a solid and common ground on software project management practices, software processes and entrepreneurship in Finland. After the course the students know how to plan and run a software project, how process models are related to software projects, and how an entrepreneur thinks, acts, and establishes a business in Finland.

**Contents:**

Software project planning, cost estimation and control. Software processes, history, maturity, and state of the practice. Software development teams and organizations. Entrepreneurship theory, entrepreneurial characteristics and skills, business start-up in Finland, LUT supporting entrepreneurship, business idea development, business opportunities, and co-creation processes.

**Teaching Methods:**

Lectures 14 h, exercises 14 h, assignments & self-study 14 h, team assignments 36 h, 1. period. Lectures 14 h, exercises 14 h, assignments & self-study 14 h, team assignments 36 h, 2. period. Total workload 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Weekly and team assignments 100 %, no exam.

**Course Materials:**

Robillard, Kruchten, and d'Astous: Software Engineering Process with the UPEDU, Addison-Wesley, 2002. Other materials announced in the lectures.

**Prerequisites:**

Software Engineering CT60A4001 or equivalent.

**Places for exchange-students? (Yes, number/No):**

Yes, 20

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

*Elective courses, min 6 ECTS cr*

**CT10A7040: Code Camp, 1 - 5 cp**

**Validity:** 01.08.2016 - 31.07.2017

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Note:**

The course is an intense course lasting from one day to a week, and the actual timing of each course is announced separately. This course can be included in one degree two times provided that the course contents are different.

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

1-4, intense course

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Jari Porras

**Aims:**

The students learn to work with given software development technologies in teams and innovate solutions to given software development challenges in a given time box.

**Contents:**

Students are presented a problem in the beginning of each code camp and they develop solutions to the problem in the given time box with the given technologies. After presenting the problem for the code camp, the students innovate possible solutions and start learning the given technologies. The main part of the code camp is spend developing the solution and learning to use the technologies in a collaborative manner before the working solutions are presented in the closing seminar. A code camp lasts typically a weekend or one week, and the technologies used in each code camp are decided case by case. The detailed implementation of each code camp is accepted by the head of the degree program, and the detailed course instructions are published in the course page in Moodle.

**Teaching Methods:**

Team software project completed in the code camp format based on the detailed course instructions. Each code camp is announced at least a month before the event, and it can last from one weekend to one week. Total workload is specified in the detailed course instructions and can be 26-130 h.

**Assessment:**

Passed/failed. Teamwork during the code camp and presentation after it.

**Course Materials:**

Study materials are specified in the detailed course instructions and during the lectures.

**Prerequisites:**

The prerequisites are specified in the detailed course instructions

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**CT30A8910: Software as a Service: Architectures and Engineering, 6 cp**

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ahmed Seffah

**Note:**

Can't be included into a same degree as CT60A7201 Architecture in Systems and Software Development or CT30A8904 Software Systems as a Service: Technology and Engineering.

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, Ph.D., PEng, HDR. Ahmed Seffah

**Aims:**

1. Understanding of the service orientation and software as a service as a fundamental shift to producing, deploying and using software applications, as well as a domain for academic research.
2. Architecting and implementing service systems and Web services that merge business and technical requirements to support the needs of an organization.
3. Mastering the technology used in modeling, designing, and composing services to create an effective SOA-based application.
4. Understanding the new business challenges and opportunities of software as a service versus shrink-wrapped software systems.
5. Applying the SOA (software-oriented architecture) and software architecture principles and techniques to the design, programming, testing, and public cloud deployment of Web services-based systems.

**Contents:**

Service-orientation fundamentals and principles. Software as a Service (SaaS). Internet of services. Platform and software engineering tools as a Service (PaaS). Infrastructure as a service (IaaS). Service-Oriented Architecture (SOA) principles and technologies. Service design patterns. Security, sustainability, and privacy. SOA governance. Service lifecycle management. Web services programming. Successful and failures stories from industry. Large team-oriented project on service systems for sustainability innovation. Sustainability is addressed at two different levels in this course: 1. Similar to security and other software quality attributes, sustainability is defined as a key quality attribute of a service system 2. Students are encouraged to consider projects related to the re-engineering of existing software systems and/or the development of innovative services to support sustainability development including the management of natural resources consumption as well as the ways software services can make citizens more aware about their impacts on the environment.

**Teaching Methods:**

Lectures 16 h, lecture preparation (weekly mandatory readings) 24 h, in class exercises 16h, practical analysis, design and development team-oriented project 64 h, Self-study and research poster 24 h. Final exam preparation 10h. Final exam (open book) 2 h. Total 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5. Final Exam 30%, Practical design, Practical analysis, design and programming project 40%, research posters 30%.

**Course Materials:**

Mandatory readings:
1. Selected chapters from Thomas Erl. Service-Oriented Architecture: Concepts, Technology and Design. Prentice Hall, 2005 (http://www.servicetechbooks.com)
2. Selected research and white papers by the professor; announced during the lecture.
Additional readings: Thomas ERL Website (http://www.serviceorientation.com) Fox, Armando and Patterson, David. Engineering Software as a Service: An Agile Approach Using Cloud Computing. First edition.

**Prerequisites:**

Advanced programming course.

**Places for exchange-students? (Yes, number/No):**

Yes

**Places for Open University Students?(Yes, number/No):**

Yes, 10

### CT60A5400: Fundamentals of Game Development, 6 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Antti Knutas

**Year:**

M.Sc. (Tech). 1

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Junior Researcher, M.Sc. (Tech.) Antti Knutas

**Aims:**

The objective for this course is for students to learn how to use the selected game development tools, and enable them to independently design and develop a small game program for the supported platforms or work as a part of a team developing a larger game product. After the course, the student is able to do independent work and is capable of acquiring further knowledge concerning the taught game development tool.

**Contents:**

Basics of the game development tool, introduction to game engines and their functions. Basics of working with 3D objects, introduction to game development-related programming. Basics of sound engineering. Gamification and Serious games.

**Teaching Methods:**

Assisted self-study, two project works. 14h of lectures, no exercises.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

Yes

**Examination in Exam (Yes/No):**

No

**Assessment:**

Grade 0-5, Teacher grading (50%) and Peer grading (50%)

**Course Materials:**

Materials provided by lecturer.

**Places for exchange-students? (Yes, number/No):**

Yes, 10-15

**Places for Open University Students?(Yes, number/No):**

This course has 15- places for open university students. More information on the web site for open university instructions.

### CT60A7322: Software Business Development, 3 cp

**Validity:** 01.08.2016 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Marianne Kinnula

**Year:**

M.Sc. (Tech.) 1-2

**Period:**

Intensive week 20

**Teaching Language:**

English

**Teacher(s) in Charge:**

Docent, Ph.D. Marianne Kinnula

**Aims:**

After completing the course, the student has knowledge of how to 1. develop a software business idea over the whole life cycle of the business, 2. conduct market and business analyses, 3. identify sources for financing the business, and how to 4. select a suitable business model for the company.

**Contents:**

The course introduces the concepts of business idea, business plan, software business models and strategies, and the software value network. Case studies vary yearly.

**Teaching Methods:**

Lectures 6 h, workshops 12 h, seminar presentations 8 h, homeworks and project (pre, course, post) 52h. Total amount 78 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0-5, pre-task, project, essay.

**Course Materials:**

To be announced in course pages and in lectures.

**Limitation for students? (Yes, number, priorities/Leave empty):**

Yes, 40.

**Places for exchange-students? (Yes, number/No):**

Yes, 5

**Places for Open University Students?(Yes, number/No):**

Yes, 5

### CT60A7510: Design Patterns, 6 cp

**Validity:** 01.08.2017 -

**Form of study:** Basic studies

**Type:** Course

**Unit:** LUT School of Business and Management

**Grading:** Study modules 0-5,P/F

**Teachers:** Ajantha Dahanayake

**Note:**

Can't be included into a same degree as CT60A7501 Object-Oriented Programming Techniques.

**Year:**

M.Sc. (Tech.) 1

**Period:**

3-4

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor Ajantha Dahanayake

**Aims:**

The students understand the advanced concepts and techniques of design patterns and object-oriented programing and the application of those concepts and techniques for solving practical problems in programming tasks.

**Contents:**

The course covers: Design Patterns and their applications, Design rules and Principles, reusability, and reflections by Introduction to Java,
Java run-time object model, composition, inheritance, interfaces, collections and containers.

**Teaching Methods:**

Period 3: Lectures 14 h, exercises 14 h, exercise & team project preparation 25 h, weekly self-study 25 h.
Period 4: Lectures 14 h, exercises 14 h, exercise & team project preparation 25 h, weekly self-study 25 h.
Total hours 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Continuous assessments: Weekly quizzes 10 %, exercises and practical assignment 50 %. Team Project 40%

**Course Materials:**

Lecture notes. Eckel, B.: Thinking in Java, Prentice Hall. Gamma, E. et al.:

Design Patterns, Addison-Wesley. Freeman, Freeman, Sierra & Bates: Head First Design Patterns, O'Reilly (2004 or newer).

**Prerequisites:**

CT60A2411 Olio-ohjelmointi (Object-Oriented Programming) or equivalent.

**Places for exchange-students? (Yes, number/No):**

Yes, 5

**Places for Open University Students?(Yes, number/No):**

This course has 1-5 places for open university students. More information on the web site for open university instructions.

**Further information:**

Moodle-exam every week.

### CS30A7402: Software and Application Innovation, 6 cp

**Validity:** 01.08.2016 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Mirva Hyypiä, Antti Herala, Jari Porras, Helinä Melkas

**Year:**

M.Sc. (Tech.) 2

**Period:**

1-2

**Teaching Language:**

English

**Teacher(s) in Charge:**

Professor, D.Sc. (Tech.) Jari Porras
Professor, D.Sc. (Tech.) Helinä Melkas

**Aims:**

This course combines technology and technology management perspectives for cross-scientific approach in software and application innovation process. After completion of the course students have broader perspective on innovation process in some yearly changing technically focused area. Students know how to innovate new meaningful software solutions and applications based on some technology, and what is the technical and business feasibility of the solution in domestic and international markets.

**Contents:**

Innovation management, idea generation and opportunity identification process. (Open) business models and technology commercialization in global markets. Product and service development. Basics and use cases of the selected technology, user-centric design and privacy perspectives in software and application development. The course is related to sustainability.

**Teaching Methods:**

Lectures 14 h. Innovation exercise to be given during the lectures 45 h, practical work (documentation) 45 h, independent group work 44 h, presentations 8 h. Total 156 h.

**Examination in Examination schedule (Yes/No):**

No

**Examination in Moodle (Yes/No):**

No

**Examination in Exam (Yes/No):**

No

**Assessment:**

0 - 5. Practical work 100 %.

**Course Materials:**

To be announced later.

**Places for exchange-students? (Yes, number/No):**

Ýes, 10-15

**Places for Open University Students?(Yes, number/No):**

No

**Related to:**

to sustainability

## CS30A7380SS: Systematic Creativity - TRIZ Basics, 3 cp

**Validity:** 01.08.2015 -
**Form of study:** Basic studies
**Type:** Course
**Unit:** LUT School of Business and Management
**Grading:** Study modules 0-5,P/F
**Teachers:** Leonid Chechurin

**Note:**
The course topics are related to sustainable development.
The course is proposed to be suitable also for doctoral studies.
**Year:**
M.Sc. 1-2
**LUT Summer School time:**
17. - 21.7.2017.
**Teaching Language:**
English
**Teacher(s) in Charge:**
Professor Leonid Chechurin, LUT
**Aims:**
After having completed the course, student should be able to:

- recognise the role, place and institutions of invention in innovation process/business
- recognise the trends of technology/technical system evolution
- model a problem situation as a contradiction and apply standard methods of their resolving. Model a problem situation as Su-Field triple and apply standard SuField transformations
- formulate the model of inventive (to be) solution
- organise effective search/adaptation of the inventive solution

**Contents:**
Introduction: creativity, invention, innovation. Creativity obstacles and supporters. Place of creativity in modern economy. Invention and
Innovation. Basic institutions of invention: know-how, patent, public good (paper). Thinking inertia and other

invention killers. Tools for creativity support and place of TRIZ among them. Genrich Altshuller and the history of TRIZ.

Part 1. Trends of Engineering System Evolution (TESE)
Altshuller's finding: evolution patters engineering systems. S-curve evolution trend, Trend of ideality increase, Dynamisation,
Functionality Increase, Transition to Macrollevel etc. Applications to technology intelligence and system design.

Part 2. Ideal Final Result concept
Axiom of Ideality in TRIZ. Formulation, examples. Operation time,
operation zone. 3 ways to reach IFR. Ideality and system reduction (trimming).

Part 3. Contradiction analysis and elimination.
Invention as contradiction elimination. Engineering contradictions and elimination standards. Altshuller Matrix. Physical contradictions and elimination standards. Separation principles. Case studies and examples, Hands on.

Part 4. SuFiled modeling and transformation
Modeling of interactions in engineering system by subject-object-action triple. Substabce-Field. Standards for SuField model
transformations. Case Studies, examples, Hands on.

Part 5. Algorithm
Algorithm of inventive problem analysis (simplified ARIZ). Case
studies. Project presentation.

Conclusion
The course is proposed to be suitable also for doctoral studies.
**Teaching Methods:**
- Lectures and exercises 24 hours
- Team work and a limited project work 20 hours
- Presentations of the results of the team work/ project work 8 hours
- Independent work, reading 26 hours

Total workload 78 hours.
**Suitability for doctoral studies (Yes/Leave empty):**
Yes
**Assessment:**
Final grade 0-5:
Attendance 30%
Test 30%
Assignment - report on project 40%
**Course Materials:**
Hand outs of lecture notes, internet resources in open access (given).
**Prerequisites:**
Preferably, students of engineering major or Bachelor degree in non-technical studies.