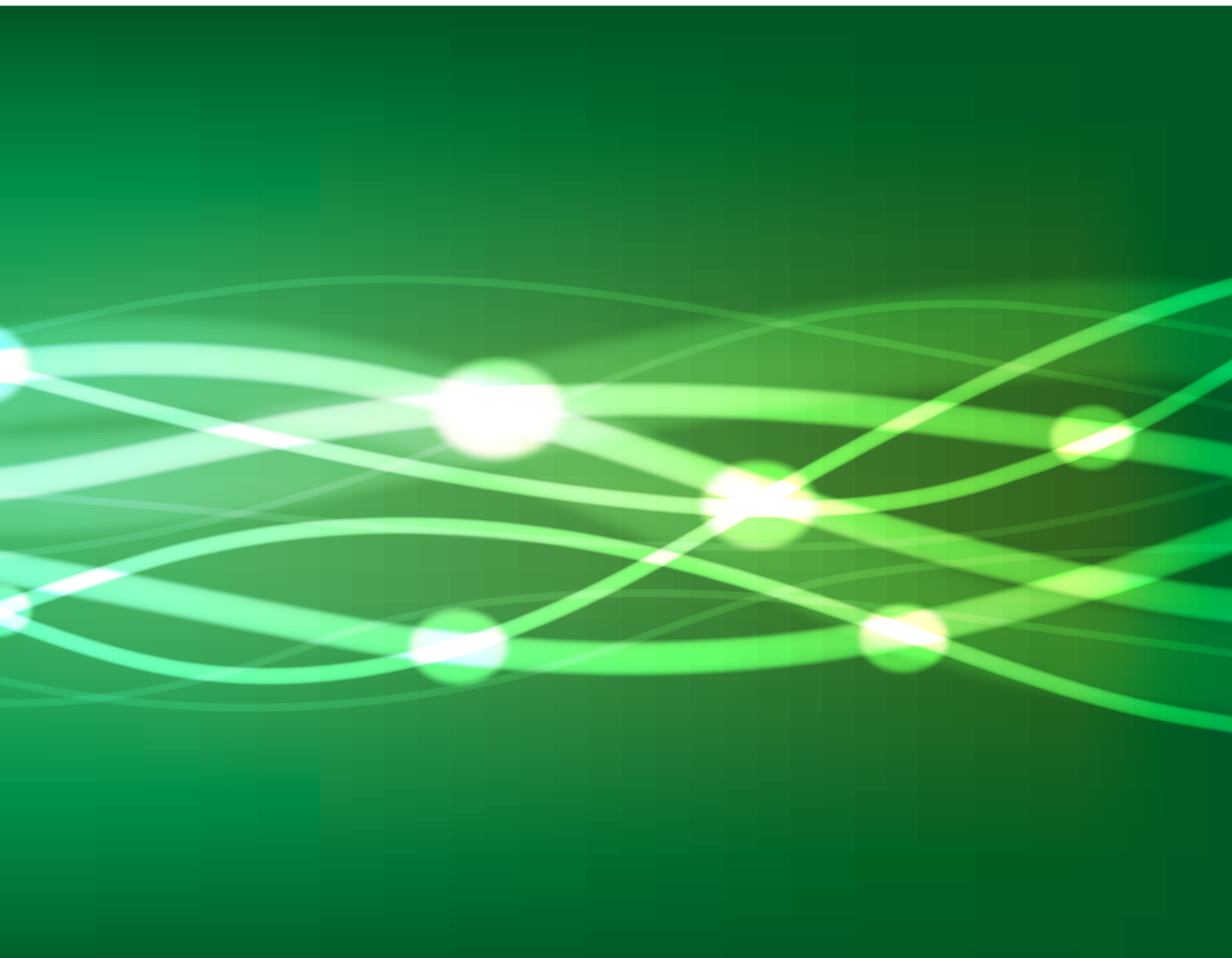


2009-2010

STUDY PROGRAMMES AND COURSES IN ENGLISH

Study Guide



STUDY GUIDE 2009-2010

STUDY PROGRAMMES AND COURSES IN ENGLISH

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University of Technology and Economics

Lappeenranta University of Technology (LUT) is an international community which conducts scientific research and academic education. LUT has more than 6 500 students and employees in positions that require a high level of expertise. Ever since its establishment in 1969, the university has been ahead of its time in combining two fields of science that complement each other – technology and business. By the beginning of 2009, over 8 000 LUT students have completed the degree of Master of Science in Technology or Master of Science in Economics and Business Administration. In addition, over 300 have obtained the postgraduate degree of Doctor of Science in Technology, Doctor of Science in Economics and Business Administration, or Doctor of Philosophy.

LUT comprehends the Faculty of Technology, the Faculty of Technology Management, and the School of Business. Their activity is supported by four research units, four independent institutes, three regional units, and University Services. Nine different degree programmes are available to students.

The following strategic areas of expertise will be developed: energy efficiency and the energy market, strategic management of business and technology, scientific computing and modelling of industrial processes, and expertise in Russian affairs in these strategic areas of expertise.

LUT graduates are educated, business-minded professionals who master their professional field and find careers in the public and industry sectors.

THE UNIVERSITY'S ACADEMIC YEAR 1 August 2009 – 31 July 2010

The periods and exam and intensive course weeks for the academic year 2009-2010:

AUTUMN SEMESTER 2009

Periods

1st 31 Aug. – 16 Oct. 2009
2nd 26 Oct. – 11 Dec. 2009

Intensive Week

Week 43 19 – 23 Oct. 2009

Exam Weeks

Week 35 24 – 28 Aug. 2009
Week 43 19 – 24 Oct. 2009
Week 51 14 – 18 Dec. 2009

SPRING SEMESTER 2010

Periods

3rd 11 Jan. – 26 Feb. 2010
4th 8 Mar. – 29 Apr. 2010 *

Intensive Weeks

Week 1 4 - 5 Jan. and 7- 8 Jan. 2010
Week 9 1 – 5 Mar. 2010
Week 19 3 – 7 May 2010

Exam Weeks

Week 1 4 - 5 Jan. and 7- 8 Jan. 2010
Week 9 1 – 6 Mar. 2010
Weeks 13-14 1 Apr and 6 -7 Apr. 2010 *
Week 18 3 – 7 May 2010
Week 19 10 – 12 May and 14 May 2010

Examinations are organised during the teaching periods on Mondays and Wednesdays at 16:15 (four- and five-hour exams start at 15:15) and on Fridays at 14:15 (also four- and five-hour exams).

On the **examination weeks** in August, October, December, January, March and May, exams start at 9.15 and 16.15 (four- and five-hour exams start at 15.15).

*On the **Easter exam week** on 1 April and 6-7 April 2010, examinations are organised Monday-Friday at 9:15 and 16:15 (five-hour exams start at 15:15). **No lectures are given during this time.**

On **May Day Eve 30 April 2010**, there are no classes or exams.

Examinations may be arranged on the **Saturdays** 24 October 2009, 6 March 2010 and 8 May 2010. The decision to arrange exams on these days will be made later.

The **exam and course schedules** will be available on the university web site.

1 Studying at Lappeenranta University of Technology

Study Right and Registration

LUT degree students must register each academic year as attending or non-attending. Each student who wishes to take part in lectures, assignments, examinations or other forms of teaching must register as attending and pay the student union membership fee. Students registered as non-attending can not take part in instruction or exams.

Registration for the academic year 2009-2010 starts 1 June 2009 and ends 24 August 2009. **The student union membership fee must be paid by all undergraduate students registered as attending. You may not register for courses or exams before you have registered for the academic year and paid the student union fee.** Students who have not registered by the deadline will be removed from the student register and will no longer be entitled to study at LUT.

Under the Universities Act, students who have been admitted to only the Master's degree (120 ECTS cr) must carry out their studies in 4 years. LUT's Master's programmes in English may have their own restrictions regarding the duration of the programme and the right to study.

For further information on registration, please contact the Student Affairs Office.

WebOodi

WebOodi is the user interface for LUT students through which they register for exams, courses, midterms and the academic year, modify their contact information in the student register and monitor the records on the courses they complete. In WebOodi you can also request that an unofficial transcript of records will be sent to you directly via e-mail.

WebOodi and instructions on its use are available on the university web site. New students will receive instruction on the use of WebOodi during orientation.

You should primarily register through WebOodi. If for some reason you can not do so, you can also register before the relevant deadline at the Student Affairs Office either in person, by telephone or by sending e-mail to opinto@lut.fi.

Students themselves are responsible for updating their personal information in the student register. You can update the information (e.g. address, e-mail and telephone) in WebOodi. If you cannot access WebOodi, you should give the information directly to the Student Affairs Office.

Registration for Courses

The times and places of the courses are given in the course schedule on the university web site.

You must register for a course before it begins. You should register for courses again each year if you wish to take part in the related lectures, tutorials or other instruction. If you plan to retake an exam you should only register for the exam.

Students can register for courses through WebOodi.

Enrolment for courses in the autumn semester 2009 starts on 1 August 2009, and for courses in the spring semester 2010 on 1 December 2009. Enrolment for each period ends as follows:

Registration for courses in Period 1 ends	Sat, 29 Aug 2009 at 20:00
Registration for courses in Period 2 ends	Thu, 22 Oct. 2009 at 23:59
Registration for courses in Period 3 ends	Sat, 9 Jan. 2010 at 20:00
Registration for courses in Period 4 ends	Thu, 4 Mar. 2010 at 23:59

In the autumn semester, lectures start on 31 August 2009, and in the spring semester on 11 January 2010.

Further instructions on registering for language courses are provided in the Language Centre study guide and on their web site.

Remember to register for both courses and exams separately.

Registration for Exams and Midterms

The dates and times of examinations and midterms are listed in the course schedule on the university web site. Registration for the exams is done through WebOodi.

Registration starts 4 weeks before the exam date and ends 1 week before the exam.

If you have registered for an exam but are unable to take it, you must cancel your registration through WebOodi. You can cancel your registration 3 working days before the exam.

Exam Date	Registration Deadline	Cancellations
Monday	Monday, a week before the exam	Wednesday, a week before the exam
Tuesday	Tuesday, a week before the exam	Thursday, a week before the exam
Wednesday	Wednesday, a week before the exam	Friday, a week before the exam
Thursday	Thursday, a week before the exam	Monday, a week of the exam
Friday	Friday, a week before the exam	Tuesday, a week of the exam

You can only take one exam during one exam session (morning of afternoon exam). This means you can take one morning and one afternoon exam in the same day.

Noppa

The study and teaching portal Noppa is a handy tool for both students and lecturers of Lappeenranta University of Technology for everyday course work and communication. Noppa is composed of course home pages that include e.g. course overviews, dates of lectures and exercises, course materials, information about assignments and exams, news and results. Noppa will be in use during academic year 2009-2010.

Evaluation of Completed Courses

Courses are evaluated either on the scale excellent (5), very good (4), good (3), very satisfactory (2), satisfactory (1) and failed (0), or pass – fail. The basis for the course evaluation (exam, assignment etc.) is given in the course descriptions in the study guide.

If students are not satisfied with their grades, they may request a correction from the teacher who gave the grade. Students can make the request orally or in writing within 14 days of the day the grade was made known. They also have the right to find out why they were given the specific grade. If the student is not satisfied with the teacher's reply to the correction request, he or she may take the matter up with the university's degree committee. The correction request must be submitted to the Student Affairs Office within 14 days of receiving the teacher's reply. The decision of the degree committee is final, no appeal can be made.

Regulations on Studies

The provisions laid down in the Universities Act and the Universities Decree apply to LUT.

Provisions on education, studying and degrees are laid down in the Government Decree on University Degrees (794/2004) and LUT's regulations for teaching and studying (approved 24/01/2007). The decree and regulations are available on the university web site.

The amended Universities Act will enter into force on 1 January 2010, and LUT's regulations and guidelines will be amended during the autumn term 2009. The new regulations will be published on the university web site.

Disciplinary Measures

LUT's regulations for teaching and studying (section 91) include provisions on disciplinary measures.

Students in breach of rules and regulations related to studies or research can be cautioned or expelled for up to one academic year. The decision to caution a student is made by the rector and to expel by the university senate.

Before the issue is processed, the student is told what he or she is accused of and given the opportunity to be heard on the matter.

If a student is caught cheating on an exam, the supervisor must remove the student from the exam hall immediately. If a student is caught cheating after the exam is over, the teacher who grades the exam must fail the student. The dean is to be notified of these measures.

When the invigilator or other teacher notices or has cause to suspect that a student has committed an offence, he or she shall notify the teacher who prepared the exam, the dean of the student's faculty and the administrative director in writing.

The administrative director together with the rector decides on the appropriate measure depending on the case. If needed, the matter will be brought before the university senate and the student may be expelled for a fixed period. As for exchange students, the home university will be notified of the offence.

In practice, expulsion for a specified period means that the student will receive a mark in his or her record: he or she will not be mentioned in the student register as an enrolled student during the period. The student's username and passwords will be revoked and the magnetic key confiscated. No student financial aid is granted for the period of expulsion.

Degree Certificates

LUT's regulations for degree certificates will be amended during the autumn term 2009. The new regulations will be published on the university web site.

Students must fill out an application for the degree certificate. The forms are available on the university web site.

Graduates from English Master's programmes receive both a Finnish and an English degree certificate. As an appendix to the degree certificate, students will receive a transcript of records in Finnish and English, and a Diploma Supplement in English.

The certificate will show e.g. the graduate's degree, Master's degree programme, major and minor subjects and their overall grades, and the grade for Master's thesis.

The student is given an overall grade, which is the weighted average of all the student's LUT courses that were graded with a number, excluding the student's thesis.

Average	Grade
1.00 – 1.49	Satisfactory
1.50 – 2.49	Very Satisfactory
2.50 – 3.49	Good
3.50 – 4.49	Very Good
4.50 – 5.00	Excellent

Also major and minor subjects are given an overall grade according to the table above. The overall grade is the average of all the LUT courses completed by the student in the subject in question, weighted according to the workload of each course.

Students will receive a special mention in their Master's degree (120 ECTS cr) certificate of having carried out their studies *with distinction* if their overall grade is at least 4 and the grade for their Master's thesis is 4 or 5 (in technology) and at least *eximia cum laude approbatur* (in business). In addition to this, at least 40 credits included in the degree must be carried out at LUT and graded on a scale of 1–5.

2 Study Guidance and Student Support Services

Study Affairs at Faculties

Study Affairs Services at the Faculty of Technology

The study affairs services team of the Faculty of Technology assists degree students, doctoral students and LUT staff members in all matters of student administration. Study guidance for the degree students is provided by study coordinators and study secretaries and for postgraduate students by the head of study affairs and the study coordinator of LUT Energy.

Study guidance for international degree students:

Ms. Minna Loikkanen, Study Coordinator, Faculty of Technology
Phone +358 5 621 2268, office 2321, minna.loikkanen(at)lut.fi

More detailed information on study affairs services and study guidance is available at the Freshman's Survival Guide 2009-2010 by Faculty of Technology.
www.lut.fi/en/technology/studies/

Study Affairs Services at the Faculty of Technology Management

The study affairs services' staff of the Faculty of Technology Management will serve degree students, doctoral students and LUT staff members in all faculty's study affairs matters. Study guidance for the degree students is provided by international officer and study coordinator and for postgraduate students by the head of study affairs.

Study guidance for international degree students:

Ms. Riitta Salminen, International Officer
Phone + 358 5 621 2659, + 358 40 717 2670, office 4406, riitta.salminen(at)lut.fi

Ms. Susanna Koponen, Study Coordinator
Phone + 358 40 352 4002, office 4426, susanna.koponen(at)lut.fi

More detailed information on study affairs services and study guidance available at the Freshman's Survival Guide 2009 by Faculty of Technology Management.
<http://www.lut.fi/en/technologymanagement/studies/>

Study Affairs at School of Business

The study affairs' services staff of the School of Business will assist degree students, doctoral students and LUT staff members in all study affairs matters. Study affairs School of Business are located in the university's 7th building in the 3rd floor.

The Head of Study Affairs manages the study affairs and takes care of postgraduate study affairs. International officer takes care of all the related issues with the master's degree program. She offers study guidance from the very beginning of the studies until graduation and helps students with their personal study plans, applications and other administrative issues.

Contact information:

Ms Minna Ranta Head of Study Affairs Tel. 05 621 7226 E-mail minna.u.ranta(a)lut.fi	Ms Essi Reponen International Officer Tel. 05 621 7214 E-mail essi.reponen(a)lut.fi
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More detailed information on study affairs www.lut.fi/kati/lfb.

Study Affairs at the Language Centre

The study affairs services team of the the Language Centre helps students with language studies related matters (e.g. enrolment for the language courses, registration for language course exams). Study guidance is provided by the student adviser, study affairs secretary and study coordinator. The Language Centre office is located on the 4th floor of the main building.

Contact information:

Ms. Jenni Ilmonen, Student Adviser, Language Centre
Contact hours: Mon - Fri 12 - 15
Phone +358 40 822 8614, office 1412B, [kike.opintoneuvoja\(at\)lut.fi](mailto:kike.opintoneuvoja(at)lut.fi)

Ms. Riikka Hämäläinen, Study Affairs Secretary, Language Centre
Phone +358 5 621 2220, office 14020, [riikka.hamalainen\(at\)lut.fi](mailto:riikka.hamalainen(at)lut.fi)

Ms. Sari Silventoinen, Study Coordinator, Language Centre
Phone +358 5 621 2208, office 14005, [sari.silventoinen\(at\)lut.fi](mailto:sari.silventoinen(at)lut.fi)

Student Affairs Office

The customer service of the Student Affairs Office helps students with registration-related matters (e.g. enrolment for the academic year, registration for courses and exams), and provides students with e.g. certificates of attendance, certificates entitling students to travel discounts, and official transcripts of records. Students may also buy the study guide from the service desk. You should contact the Student Affairs Office whenever you have questions regarding e.g. your right to study or the entry of grades into the student register. The Student Affairs Office is located on the 1st floor of the main building.

You may visit the customer service office from Monday to Thursday between 12.00 and 15.00 and on Friday between 12.00 and 14.00. At other times you can contact the office staff by telephone. The telephone numbers are +358 5 621 6062 and +358 5 621 6063, and the e-mail address is opinto@lut.fi.

Transcript of Records and Registration Certificate

You can order a transcript of records in Finnish or English from the Student Affairs Office. A fee (2 €) is charged for an official transcript.

The registration certificate or certificate of attendance is available in Finnish or English. There are different registration certificates for different purposes, so please mention why you need it.

International and Career Services

The International and Career Services of Lappeenranta University of Technology are in charge of student exchange and international internships and help students find employment and employers find specialists for various professional tasks.

International Services provide guidance and counselling in practical matters to all international students studying at LUT. International services are in charge of the university's international student exchange – both students going abroad to study and those coming to Lappeenranta. Thanks to an extensive cooperation network, LUT students have the opportunity to take part in exchange programmes around the world and welcomes international exchange students from over 140 partner universities.

Students of Master's degree programmes in English are not, however, entitled to participate in student exchange. Students participating in MITIM Double Degree programme make an exception; part of their studies is carried out abroad.

International Services are responsible for the International Business and Technology Management programme. Both international exchange students and LUT's own students may take courses in the programme.

Career Services help students to plan internships, Master's thesis projects and other employment as well as international internships. They provide facilities and tools for searching for information on jobs, employers and looking for work. Students may use the telephone, copy machine, fax and computers free of charge.

Career Services give students tools for looking for employment and for planning their career. In practice, this means that students are offered training and personal guidance related to job searching and working life. Furthermore, Career Services annually organise various recruitment and corporate events.

LUT's International and Career Services are located in the university's main building, the 3rd floor of the 1st section. The office is open from Monday to Thursday 9.30-15.00 and on Friday 9.30-14.00

Contact information of International Services:

Support Services for Incoming Master's Degree Students
Ms Pirkko Pesu, International Coordinator
Phone +358 40 738 1318
E-mail Pirkko.Pesu(at)lut.fi

Incoming Exchange Students
Ms Virpi Maunuksela, International Coordinator
Phone +358 40 738 1315
E-mail Virpi.Maunuksela(at)lut.fi

Incoming Exchange Students
Ms Johanna Härkönen, International Study Secretary
Phone +358 40 738 1303
E-mail Johanna.Harkonen(at)lut.fi

Origo and the Learning Centre

Origo provides LUT students a working and study environment complete with information services. Origo houses both the LUT library and the Learning Centre. The facilities are equipped with top-of-the-line technology and software for e.g. group work, online studies, electronic exams, information retrieval, assignments, and final theses. You can contact the Origo helpdesk (www.lut.fi → Studies → Helpdesk Origo) by telephone +358 5 621 7027 or by e-mail origo@lut.fi. The helpdesk also lends out different equipment for studies, assists in the use of Origo services, and provides general support in the use of information and communication technology.

The Learning Centre's services concentrate on the development of studies and instruction, and on making studies more flexible. The services include user support for the Noppa study portal, an online platform (Blackboard), a feedback system (Webropol) and exam aquarium software (SoftTUTOR), and consultation with a study counselling psychologist. In addition, the Learning Centre coordinates LUT's peer tutoring and offers related training in cooperation with the faculties.

Study Counselling Psychologist

The study counselling psychologist provides support in questions involving studies. The psychologist can help students e.g. in recognising their own unique learning style, getting studies going and finding motivation. The counselling is fully confidential. The psychologist's office number is 1214, and he can be reached by telephone (+358 40 740 9881) or by e-mail ([timo.suhola\(at\)lut.fi](mailto:timo.suhola(at)lut.fi)).

Library

The library provides a wide range of services and has an extensive collection of electronic and printed publications for the students and staff to use. The LUT library is a scientific library open to the public.

Students need the library when they borrow course books or search for information for their assignments or theses. Books are borrowed and returned at the check-out desk or the self-service machine. The library also provides instruction on information retrieval for studies. Tailored education is available at different stages of studies. The information desk provides help on a daily basis.

Material that is not available in the library's own collections can be borrowed from other libraries.

The opening hours during the semester are Mon-Thu 8.30-18.00 and Fri 8.30-15.30. Information on changes in the regular opening hours will be posted by the library entrances and on the library's web site.

3 Master's Degree Programmes in English at LUT

At Lappeenranta University of Technology, the higher university degrees are Master of Science in Technology (120 ECTS credits) and Master of Science in Economics and Business Administration (120 ECTS credits).

Students are admitted into Master's degree programmes, which lead to these degrees. A degree programme is an entity of courses with scholarly and often also professional aims. Students specialise in a professional field of technology or business and its development.

The Master's degree programmes in English at LUT are:

- Master's Degree Programme in Bioenergy Technology
- Master's Degree Programme in Chemical and Process Engineering
- Master's Degree Programme in Electrical Engineering
- Master's Degree Programme in Mechanical Engineering
- Master's Degree Programme in New Packaging Solutions
- Master's Degree Programme in Technomathematics and Technical Physics
- Master's Degree Programme in Information Technology
- CBU Master's Degree Programme in Information and Communications Technology
- Fenno-Russian Master's Degree Programme in Information Technology
- Master's Degree Programme (CBU) in Business and Administration in the field of International Technology and Innovation Management (MITIM)

Measurement of Studies

The studies are measured in credits (cr). The average annual workload of a student is 1600 hours of work, which is worth 60 ECTS credits. One credit refers to an average input of 26 hours of work by a student. Credits are recorded only in whole numbers, not decimals.

Courses included in the degrees are either obligatory, optional or elective.

Major and Minor Subjects

The degree programmes are divided into major subjects. In the Master's degree, the major studies are advanced studies.

The degrees include also minor studies. There may be restrictions in selecting a minor subject in certain degree programmes. Further details on these restrictions are provided in the section of each Master's degree programme.

Personal Study Plan

A personal study plan is an outline prepared by the student of the content and schedule of his/her studies. The plan includes the courses the student wishes to include in the degree and the organisation of the studies, following the requirements set in the study guide. The studies are completed according to the study guide.

The study plan is made for the entire duration of the studies. At LUT, the personal study plans are reviewed and revised two times during the studies (Master's Degree students): at the beginning of studies and when applying for the Master's thesis topic. For further information, please contact the study guidance staff of the degree programmes.

Master's Thesis

The Master's thesis is the final project of the Master's degree studies. It demonstrates the student's knowledge of a scientifically or socially important topic related to his or her professional field. The Master's thesis is a research project which requires approximately 6 months of work and it is worth 30 ECTS credits. The Master's thesis is related to the student's major subject and its topic is agreed on by the supervisor and the student together.

Before starting their thesis, students must read the related instructions given by the vice-rector in charge of teaching. The instructions are available at the end of this guide and on the university web site. Faculties may also give their own instructions for the Master's thesis.

The faculty council will assess the thesis. The Master's thesis in technology is evaluated on the scale excellent (5), very good (4), good (3), very satisfactory (2), satisfactory (1) and failed (0). The Master's thesis in business is evaluated on the scale laudatur, eximia cum laude approbatur, magna cum laude approbatur, cum laude approbatur, non sine laude approbatur, lubenter approbatur, approbatur, improbatur (failed).

Postgraduate Degrees

After the Master's degree, LUT offers good possibilities for completing a postgraduate degree. The postgraduate degrees of the university are the degrees of Licentiate of Science in Technology, Licentiate of Science in Economics and Business Administration, Doctor of Science in Technology, Doctor of Science in Economics and Business Administration, and Doctor of Philosophy.

The licentiate degree usually requires two years of full-time studies. The doctoral degree, on the other hand, requires approximately four years of full-time studies. The workload of the postgraduate studies is 60 credits, which is divided into 35-40 ECTS credits of major studies and 20-25 ECTS credits of other studies. The studies are composed of courses organised by a graduate school or equivalent, university courses, literature exams or other scientific courses. In addition, postgraduate students must prepare a licentiate thesis or a doctoral dissertation, which is defended in a public examination.

If you wish to take part in postgraduate studies, you should consult the professor of the major subject in question and submit your application and study plan to the faculty council. The rector decides whether or not to grant the right to postgraduate studies after hearing the faculty council.

Details are available from the faculty study guidance staff and on the university web site www.lut.fi/en/lut/studies/postgraduate/Pages/Default.aspx .

4. Faculty of Technology

4.1. Master's Degree Programme in Bioenergy Technology

The Master's degree programme in Bioenergy Technology corresponds to 120 ECTS credits and leads to the degree of Master of Science in Technology. It provides training in following major subjects:

- Bio-Energy Technology
- Environmental Energy Technology

The Aims of the Master's Degree Programme

The Master's degree programme responds to the needs of the changing society regarding sustainable energy and environmental engineering in a socially responsible international context. Our aim is to educate industrially orientated, world-class professionals with firm theoretical understanding and profound expertise in the following fields of specialization:

- Bio-Energy Technology - includes topics such as biofuel production and refining technologies, bioenergy end-use technologies and international trade of biofuels.
- Environmental Engineering - focuses on reducing the environmental impacts of energy production, such as energy production technologies using different types of renewable fuels and new pollution control technologies.

The graduate is expected to

- be able to describe sustainability in energy production
- be able to design power engines in renewable energy
- understand and describe the special characteristics of the waste-to-energy technologies compared to other energy production technologies
- be able to explain the function of the most important emission reduction methods
- be familiar with the techniques of integrating environmental issues into decision-making processes
- be able to identify the advantages of using bioenergy, name the most important bioenergy sources and recognise the technical and economical possibilities to use bioenergy technology solutions
- be able to work with others in task-orientated groups, participating and interacting in the group in a productive manner for him/herself and for the group as a whole
- be familiar with mathematical tools needed, optimization, simulation, numerical methods

The Degree Structure of the Programme

Degree Structure		
General Studies	21	ECTS cr
Major Subject	30	ECTS cr
Minor Subject	20-22	ECTS cr
Elective Studies	17-19	ECTS cr
Master's Thesis and Seminar	30	ECTS cr
<i>Total</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

The recommended major and minor subject combination is shown in the table below. However, the student may choose any of the minor subjects offered by LUT Energy (Bio-Energy Technology, Environmental Energy Technology, Industrial Embedded Systems or Power Electronics and Electrical Drives) provided that the major and the minor do not contain same courses.

Subject combination	
Major Subject	Minor Subject
Environmental Energy Technology	Bio-Energy Technology
Bio-Energy Technology	Environmental Energy Technology

Environmental Energy Technology

The person responsible for major in Environmental Energy Technology is professor, D.Sc. (Econ.) Lassi Linnanen

General Studies 21 ECTS cr

<i>Obligatory Studies (21 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AB30A0300 International Finance and Emerging Markets	M.Sc. (Econ. & Bus. Adm.) 1	2	5
BM20A1300 Complex Analysis	M.Sc. (Tech.) 1-2	1	3
BM20A2701 Numerical Methods II	M.Sc. (Tech.) 1	4	3
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3	1, 2,	2
	M.Sc. (Tech.) 1-2	3, 4	
	B.Sc. (Econ. & Bus. Adm.) 2-3		
	M.Sc. (Econ. & Bus. Adm.) 1-2		
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3	1-2,	4
	M.Sc. (Tech.) 1-2	3-4	
	B.Sc. (Econ. & Bus. Adm.) 3		
	M.Sc. (Econ. & Bus. Adm.) 1-2		
FV18A9101 Finnish 1		1, 3	2
FV18A9201 Finnish 2		2, 4	2

Major Subject 59 ECTS cr

<i>Obligatory Studies (59 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH40A1300 Power Engines in Renewable Energy	M.Sc. (Tech.) 2	2	5
BH50A1200 Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BH60A1600 Basic Course on Environmental Management and Economics	B.Sc. (Tech.) 2	1-2	5
BH60A2000 Emission Trading	M.Sc. (Tech.) 1	3-4	3
BH60A2200 Air Pollution Control	M.Sc. (Tech.) 1	3-4	3
BH60A2400 Solid Waste Management Related to Energy Production	M.Sc. (Tech.) 2	1-2	4
BH80G0000 Bioenergy Thesis	M.Sc. (Tech.) 1	1	3
Master's Thesis and Seminar			30

Minor Subject 22 ECTS cr

<i>Bio-Energy Technology (22 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH50A1300 Maintenance Management	M.Sc. (Tech.) 2	1-2	4
BH50A1400 Steam Boilers	M.Sc. (Tech.) 1	1-2	6
BH60A2300 Waste Heat Recovery Techniques	M.Sc. (Tech.) 2	3-4	6
BH80G0100 Bioenergy Technology Solutions	M.Sc. (Tech.) 1	2-3	6

Elective Studies 18 ECTS cr

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise.

Bio-Energy Technology

The person responsible for major in Bio-Energy Technology is professor, D.Sc. (Tech.) Esa Vakkilainen

General Studies 21 ECTS cr

<i>Obligatory Studies (21 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AB30A0300 International Finance and Emerging Markets	M.Sc. (Econ. & Bus. Adm.) 1	2	5
BM20A1300 Complex Analysis	M.Sc. (Tech.) 1-2	1	3
BM20A2701 Numerical Methods II	M.Sc. (Tech.) 1	4	3
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3 M.Sc. (Tech.) 1-2	1, 2, 3, 4	2
	B.Sc. (Econ. & Bus. Adm.) 2-3 M.Sc. (Econ. & Bus. Adm.) 1-2		
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3 M.Sc. (Tech.) 1-2	1-2, 3-4	4
	B.Sc. (Econ. & Bus. Adm.) 3 M.Sc. (Econ. & Bus. Adm.) 1-2		
FV18A9101 Finnish 1		1, 3	2
FV18A9201 Finnish 2		2, 4	2

Major Subject 60 ECTS cr

<i>Obligatory (60 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH40A1300 Power Engines in Renewable Energy	M.Sc. (Tech.) 2	2	5
BH50A1200 Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BH50A1300 Maintenance Management	M.Sc. (Tech.) 2	1-2	4
BH50A1400 Steam Boilers	M.Sc. (Tech.) 1	1-2	6
BH80G0000 Bioenergy	M.Sc. (Tech.) 1	1	3
BH80G0100 Bioenergy Technology Solutions	M.Sc. (Tech.) 1	2-3	6
Thesis Master's Thesis and Seminar			30

Minor Subject 21 ECTS cr

<i>Environmental Energy Technology (21 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH60A1600 Basic Course on Environmental Management and Economics	B.Sc. (Tech.) 2	1-2	5
BH60A2000 Emission Trading	B.Sc. (Tech.) 3	3-4	3
BH60A2200 Air Pollution Control	M.Sc. (Tech.) 1	3-4	3
BH60A2300 Waste Heat Recovery Techniques	M.Sc. (Tech.) 2	3-4	6
BH60A2400 Solid Waste Management Related to Energy Production	M.Sc. (Tech.) 2	1-2	4

Elective Studies 18 ECTS cr

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise.

Additional Information

Personal Study Plans

At the beginning of their studies, students prepare a personal study plan, in which the student and the contact persons of the degree programme agree on what studies the student will pursue and in what order. This plan includes detailed information on the major subject, minor subject, general studies, elective studies, credit transfer from previous degree/studies and possible complementary studies.

Credit Transfers

ECTS credits can be transferred from the student's previous university level studies or higher university degrees from Finnish or foreign universities. More information on credit transfer is available from Study Coordinator.

Complementary Studies (20-60 ECTS cr)

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree. The course FV13A1200 Teknisk svenska 2 ECTS cr is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.

Further Information

Programme Coordinator: Professor, D.Sc. (Tech.) Esa Vakkilainen
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Study Coordinator, Faculty of Technology:

Ms. Minna Loikkanen

Phone +358 5 621 2268, room 2321, minna.loikkanen(at)lut.fi

The Courses Offered in English

		<i>ECTS cr</i>
BH40A1300	Power Engines in Renewable Energy	5
BH50A1200	Energy Systems Engineering	6
BH50A1300	Maintenance Management	4
BH50A1400	Steam Boilers	6
BH60A1600	Basic Course on Environmental Management and Economics	5
BH60A2000	Emission Trading	3
BH60A2200	Air Pollution Control	3
BH60A2300	Waste Heat Recovery Techniques	6
BH60A2400	Solid Waste Management Related to Energy Production	4
BH80G0000	Bioenergy	3
BH80G0100	Bioenergy Technology Solutions	6

<i>BH40A1300</i>	<i>POWER ENGINES IN RENEWABLE ENERGY</i>	<i>5 ECTS cr</i>
	Power Engines in Renewable Energy	
Year and Period	M.Sc. (Tech.) 2, Period 2	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Jari Backman	
Aims	The course gives a comprehensive view on power engines on the market that can be used in bioenergy conversion.	
Content	Gas turbines, compressors, turbines, fuel cells, reciprocative engines.	
Modes of Study	Four combined lectures and tutorials, each 4 hours. The students are expected to study the Material Notebook and Blackboard in advance to pass the required exercises and quizzes.	
Evaluation	0-5. The evaluation is based on the quizzes and final exam, which will be completed in the Exam Aquarium with Blackboard. Extra points for approved (50%) performance in the quizzes and exercises.	
Study materials	Material Notebook, Blackboard course material: summary, exercises, quizzes.	

<i>BH50A1200</i>	<i>ENERGY SYSTEMS ENGINEERING</i>	<i>6 ECTS cr</i>
	Energy Systems Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	The course gives a comprehensive view towards different types of energy production processes. The course focuses on optimum plant requirements in the planning and implementation phases of energy systems.	
Content	History and fundamentals of thermodynamics and energy engineering. Modern problems of power plant engineering, combined heat and power production. Fundamentals of steam and gas turbines in power production.	
Modes of Study	Control structure. Planning and implementation of energy systems. Economic optimization of energy system projects. Lectures and case exercises 14 h, 1st period. Lectures and case exercises 14 h, 2nd period. Written assignment, examination.	
Evaluation	0-5, written assignment 30%, examination 70%.	

<i>BH50A1300</i>	<i>MAINTENANCE MANAGEMENT</i>	<i>4 ECTS cr</i>
	Maintenance Management	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	The course gives a comprehensive view towards organising, planning and diagnosing maintenance especially in power plants.	

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Content	Terminology. Maintenance strategies and monitoring. Failure mechanisms and reliability. Organisation and functions of maintenance management. Preventive maintenance. Spare part management. Maintenance information systems.
Modes of Study	Lectures and case exercises 14 h, 1st period. Lectures and case exercises 6 h, 2nd period. Written assignment.
Evaluation	0-5, written assignment 30%, examination 70%.

BH50A1400	STEAM BOILERS	6 ECTS cr
	Steam Boilers	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	The course gives a comprehensive view towards steam boilers using different types of fuels. The course concentrates on boilers utilising biofuels.	
Content	Characteristics of fuels. Combustion and gasification. Design of a steam boiler and its components. Mathematical modeling and algorithmization. Operation and maintenance of boilers: Corrosion, Fouling, Emissions.	
Modes of Study	Lectures and case exercises 14 h, 1st period. Lectures and case exercises 14 h, 2nd period. Written assignment, examination.	
Evaluation	0-5, written assignment 30%, examination 70%.	

BH60A1600	BASIC COURSE ON ENVIRONMENTAL MANAGEMENT AND ECONOMICS	5 ECTS cr
	Basic Course on Environmental Management and Economics	
Year and Period	B.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	The aim of the course is to introduce students to the challenges that sustainable development poses to business and to the methods that control those challenges.	
Content	Identifying the influence of sustainable development on business. Identifying corporate stakeholders and their importance. Recognising tools and indicators of environmental management. Knowing the basics of LCA and environmental product design. Recognising eco labels, eco profiles and indicators of environmental load. Knowing the basics of building and maintaining an environmental management system.	
Modes of Study	Intensive course. Lectures 24 h, written assignment, 1st and/or 2nd period. Examination, Blackboard.	
Evaluation	0-5, examination 75%, written assignment 25%.	
Study materials	Literature will be announced later.	

BH60A2000	EMISSION TRADING	3 ECTS cr
	Emission Trading	
Year and Period	B.Sc. (Tech.) 3, Period 3-4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	The goal of the course to provide students with the basics of different emission trading schemes and their effects on industry as well as consumers.	
Content	Topics include: greenhouse effect and climate change, the Kyoto protocol and Kyoto mechanisms, the EU emission trading scheme, the effect of EU emission trading on different industries.	
Modes of Study	Lectures 14 h, 3rd period.	

Evaluation	Assignment and seminars, 4th period. Examination. Blackboard.
Study materials	0-5, examination 75%, assignment 25 %. Course material will be announced later.

BH60A2200	AIR POLLUTION CONTROL	3 ECTS cr
	Air Pollution Control	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Risto Soukka	
Aims	The course gives a comprehensive view towards different types of gas emissions and gas cleaning techniques. Appliance technology, and the design and manufacture of appliances are introduced.	
Content	Gas emissions from combustion, industry and municipalities. Emission matter collection, treatment and recycling. Cleaning techniques: cyclones, electrostatic precipitators, fabric filters, scrubbers, incinerators, and adsorption.	
Modes of Study	Lectures 8 h, seminar work and written assignment, written examination.	
Evaluation	0-5, 75% exam, 25% seminar work and written assignment.	
Study materials	De Nevers Noel: Air Pollution Control Engineering	

BH60A2300	WASTE HEAT RECOVERY TECHNIQUES	6 ECTS cr
	Waste Heat Recovery Techniques	
Year and Period	M.Sc. (Tech.) 2, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	The course gives a comprehensive view towards different waste heat recovery techniques.	
Content	Waste heat recovery opportunities. Dimensioning the heat recovery heat exchanger. Heat recovery in an industrial plant. Economic optimisation for cross flow gas-to-gas heat exchangers. Optimisation of a heat recovery unit in a ventilation system. Recuperative heat exchangers connected with stream flow. Dimensioning of waste heat recovery equipment. Pinch analysis of heat recovery networks. Suitable also for postgraduate studies.	
Modes of Study	Lectures 12 h, seminar work, written assignment, written examination.	
Evaluation	0-5, 75% exam, 25 % seminar work and written assignment.	
Study materials	Course material will be announced during lectures.	

BH60A2400	SOLID WASTE MANAGEMENT RELATED TO ENERGY PRODUCTION	4 ECTS cr
	Solid Waste Management related to Energy Production	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Mika Horttanainen	
Aims	The course gives a comprehensive view on the waste-to energy technologies and utilisation of by-products coming from energy production units.	
Content	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, utilisation and treatment of other flue gas residues, anaerobic digestion of waste, landfill gas utilisation in energy production.	
Modes of Study	Lectures 14 h, exercises 14 h, 1 practical assignment, assignment info 2 h, examination.	
Evaluation	Exam 70 %, practical assignment 30 %.	
Study materials	Course book (to the appropriate extent): Niessen, W., 2002. Combustion and incineration processes. Marcel Dekker, Inc., New York. SBN: 0-8247-0629-3. Blackboard.	

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Prerequisites	Basic knowledge on thermodynamics, chemistry and power plant technology.	
BH80G0000	BIOENERGY	3 ECTS cr
	Bioenergy	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Tapio Ranta	
Aims	The course gives a comprehensive view into the whole bioenergy chain – biofuel production, refining and end use. Students will gain an overview of the biofuel-based energy systems.	
Content	The role of bioenergy in the EU energy policy, incentive programmes and future plans. Raw-material sources of bioenergy, resources and current use. Biomass supply systems and biofuel refining technologies, logistics and international trade. Quality control and standards. Biogas, solid and liquid biofuels.	
Modes of Study	Lectures 14 h.	
Evaluation	Written examination.	
Study materials	Examination 100%. Blackboard. Energy Visions 2030 for Finland, VTT Energy, 2001. Additional material will be announced later during lectures.	
BH80G0100	BIOENERGY TECHNOLOGY SOLUTIONS	6 ECTS cr
	Bioenergy Technology Solutions	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Teacher(s)	Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	The course gives a detailed view into the technological solutions used in the bioenergy sector, the fuel production and bioenergy end-use technologies. Students will learn about the fundamental aspects of the technology for using biofuels in the energy system.	
Content	Technological solutions and case studies from biomass supply and biofuel refining, end-use technologies of biofuels in different sectors.	
Modes of Study	Lectures 14 h. Teamwork assignment, seminar presentation.	
Evaluation	Written examination.	
Study materials	Examination 60%, teamwork assignment 40%. Energy Visions 2030 for Finland, VTT Energy, 2001. Additional material will be announced later during lectures.	
Prerequisites	BH80G0000 Bioenergy	

4.2. Master's Degree Programme in Chemical and Process Engineering

The Master's degree programme, titled as "Innovative Process and Product Engineering", takes two years, corresponds to 120 ECTS credits and leads to the degree of Master of Science in Technology. Three semesters include lectures and exercises, as well as laboratory and project work. The fourth semester is devoted to the Master's thesis. The language of tuition in the programme is English.

The Aims of the Master's Degree Programme

The general objective of the programme is to give students sufficient scientific and technological knowledge for the career of chemical and process engineers in different fields of process industry. Moreover, the students will attain the basis for doctoral/Ph.D. studies and for continuous education in the field.

A specific goal is to promote and develop students' abilities to create innovations and new technology. This is realized by offering interdisciplinary education and special courses focusing on the development of innovation-related skills. The programme also emphasizes internationality and communication skills needed in the modern working environment.

Careers for Graduates

The programme gives students capabilities to work in different kind of assignments in process industry, most typically in R&D, design and operation of plants. Most graduates will find their placement in chemical, pulp and paper or metallurgical industry. However, nowadays the skills of chemical engineers have more and more demand also outside the traditional process industry.

Major and Minor Subjects

Major Subject: Sustainable Process Engineering

The Person responsible for major in Sustainable Process Engineering is professor, D.Sc. (Tech.) Ilkka Turunen

The major subject includes thorough courses on product, process and plant design. The goals of modern engineering work, such as sustainability, innovativeness and interdisciplinary methodology, are emphasized in addition to more traditional, but still important economical and technological objectives. Deep phenomenological description of the most important unit processes is included. Moreover, courses on specific unit operations can be chosen from a wide list.

Minor Subject: Advanced Design Methodology

The person responsible for minor in Advanced Design Methodology is professor, Ph.D. Andrzej Kraslawski

The minor topic gives students skills and knowledge for process design and R&D. The development of new technology and innovations is emphasized in the programme. Therefore courses such as creative design, process intensification and process modelling are included. In addition, courses on important computational tools, e.g. process simulation and computational fluid dynamics, belong to the subject.

The Degree Structure

A General studies	9	ECTS cr
B Major subject	70	ECTS cr
C Minor subject	20	ECTS cr
D Elective studies	21	ECTS cr
<i>Credits</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

General Studies

General studies mainly consist of communication and language courses, emphasizing one of the goals of the programme: to train students to act in modern, international working environment of today.

<i>Obligatory Studies (9 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ10A0500	Cross-Cultural Communication for Working Life	M.Sc. (Tech.) 1	3	2
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
FV10A 6EC	Language and Communication Studies			6

Major Subject
Sustainable Process Engineering

<i>Obligatory Studies (59 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ20A1800	Chemical Engineering Unit Operations II B	M.Sc. (Tech.) 1	1-2	5
BJ30A0500	Project on Process and Plant Design	M.Sc. (Tech.) 2	1-2	11
BJ40A0100	Product Design	M.Sc. (Tech.) 1	4	5
BJ90A0720	Chemical Separation Methods	M.Sc. (Tech.) 1	3-4	8
Thesis	Master's Thesis and Seminar			30

Min. 11 ECTS credits should be selected to attain 70 ECTS credits.

<i>List of selectable courses</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ10A0400	Process Control Systems in Pulp and Paper Industry	M.Sc. (Tech.) 2	1-2	3
BJ20A0800	Treatment Processes of Industrial Discharges	B.Sc. (Tech.) 3	3-4	5
BJ20A1100	Filtration and Mixing	M.Sc. (Tech.) 1	3-4	6
BJ60A1000	Fiber and Paper Technology; Personal Assignment	M.Sc. (Tech.) 1-2	3-4/1-2	6
BJ60A1400	Chemical Pulping Technology	M.Sc. (Tech.) 1	1-2	5

Minor Subject
Advanced Design Methodology

<i>Min. 20 ECTS credits should be selected</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	M.Sc. (Tech.) 2	2	6
BJ30A1600	Advanced Process Simulation	M.Sc. (Tech.) 1	3-4	8
BJ40A0000	Creative Design	M.Sc. (Tech.) 1	1	3
BM20A3900	Modelling Methodology in Process Engineering	M.Sc. (Tech.) 1	1-2	6

Elective Studies

Elective studies are needed to attain the full 120 ECTS credits. All the courses included in the IPPE-programme support the objectives of the programme. Consequently, it is recommended that students would choose their elective studies among the courses that are listed under selectable courses in the major subject. However, elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise.

Major Subjects for Double Degree Students

Pulp and Paper Technology

The person responsible for major in Pulp and Paper Technology is professor, D.Sc. (Tech.) Isko Kajanto

<i>Obligatory Studies (60 - 64 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ30A1401	Process and Product Innovations	M.Sc. (Tech.) 1-2	1-4	10
BJ60A1000 ⁽¹⁾	Fiber and Paper Technology; Personal Assignment	M.Sc. (Tech.) 1-2	3-4/1-2	6
BJ60A1100 ⁽¹⁾	Fiber and Paper Technology; Personal Assignment	M.Sc. (Tech.) 1-2	3-4/1-2	10
BJ60A1300	Usage and Properties of Paper	M.Sc. (Tech.) 1	3-4	5
BJ60A1400	Chemical Pulping Technology	M.Sc. (Tech.) 1	1-2	5
BJ60A1500	Fiber and Paper Basics	M.Sc. (Tech.) 1	1-2	4
Thesis	Master's Thesis and Seminar			30

¹⁾ Exchangeable

Min. 10 ECTS credits should be selected to attain 70 ECTS credits.

<i>List of selectable courses</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	M.Sc. (Tech.) 2	2	6
BJ30A1600	Advanced Process Simulation	M.Sc. (Tech.) 1	3-4	8
BJ40A0000	Creative Design	M.Sc. (Tech.) 1	1	3
BM20A3900	Modelling Methodology in Process Engineering	M.Sc. (Tech.) 1	1-2	6

Process Metallurgy

The person responsible for major in Process Metallurgy is senior assistant, D.Sc. (Tech.) Kimmo Klemola

<i>Obligatory Studies (59 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ20A0800	Treatment Processes of Industrial Discharges	B.Sc. (Tech.) 3	3-4	5
BJ20A1100	Filtration and Mixing	M.Sc. (Tech.) 1	3-4	6
BJ30A1401	Process and Product Innovations	M.Sc. (Tech.) 1-2	1-4	10
BJ90A0720	Chemical Separation Methods	M.Sc. (Tech.) 1	3-4	8
Thesis	Master's Thesis and Seminar			30

Min. 11 ECTS credits should be selected to attain 70 ECTS credits.

<i>List of selectable courses</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	M.Sc. (Tech.) 2	2	6
BJ30A1600	Advanced Process Simulation	M.Sc. (Tech.) 1	3-4	8
BJ40A0000	Creative Design	M.Sc. (Tech.) 1	1	3

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Minor in Chemical Engineering (min. 20 ECTS cr):

Minor in Chemical Engineering can be studied by students of other Master's Degree programmes.

<i>Obligatory for all</i>		<i>per.</i>	<i>op</i>
BJ20A1600 ^(*)	Chemical Engineering Unit Operations I	1-2	4
⁾ literature exam: Coulson&Richardson, Chemical Engineering (particular chapters)			
<i>Obligatory Studies, choose one course:</i>		<i>per.</i>	<i>ECTS cr</i>
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	2	6
BJ30A1600	Advanced Process Simulation	3-4	8
BM20A3900	Modelling Methodology in Process Engineering	1-2	6
BJ70AJ105	Multivariate Methods in Analytical Chemistry		4
<i>Elective Studies, choose enough courses to attain 20 ECTS cr together with the chosen obligatory courses</i>		<i>per.</i>	<i>ECTS cr</i>
BJ20A1100	Filtration and Mixing	3-4	6
BJ20A1800	Chemical Engineering Unit Operations II B	1-2	5
BJ20A1900	Advanced Course in Environmental Technology and Unit Operations	3-4,1	8

Additional Information

Master's Thesis

The Master's thesis is a demanding research or design project carried out in the field of the student's major subject.

Language Studies

Please note that there are restrictions concerning courses that can be included in the obligatory language studies.

Personal Study Plans

At the beginning of their studies, students prepare a personal study plan, in which the student and the contact persons of the degree programme agree on what studies the student will pursue and in what order. This plan includes detailed information on the major subject, minor subject, general studies, elective studies, credit transfer from previous degree/studies and possible complementary studies.

Credit Transfers

ECTS credits can be transferred from the student's previous university level studies or higher university degrees from Finnish or foreign universities. More information on credit transfer is available from Study Coordinator.

Complementary Studies (21-60 ECTS cr)

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree. The course FV13A1200 Teknisk svenska 2 ECTS cr is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree. Further information on complementary studies: Senior Assistant Harri Niemi (room 2120, harri.niemi@lut.fi).

Further Information

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The Courses Offered in English

		<i>ECTS cr</i>
BJ10A0001	Laboratory Work Course in Chemical Technology	10 - 30
BJ10A0201	Master's Thesis and Seminar	30
BJ10A0400	Process Control Systems in Pulp and Paper Industry	3
BJ10A0500	Cross-Cultural Communication for Working Life	2
BJ20A0301	Introduction to Process Simulation	5
BJ20A0800	Treatment Processes of Industrial Discharges	5
BJ20A1100	Filtration and Mixing	6
BJ20A1800	Chemical Engineering Unit Operations II B	5
BJ20A1900	Advanced Course in Environmental Technology and Unit Operations	8
BJ30A0500	Project on Process and Plant Design	11
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	6
BJ30A1401	Process and Product Innovations	10
BJ30A1600	Advanced Process Simulation	8
BJ40A0000	Creative Design	3
BJ40A0100	Product Design	5
BJ50A0400	Advanced Course in Membrane Technology and Technical Polymer Chemistry	10
BJ60A1000	Fiber and Paper Technology; Personal Assignment	6
BJ60A1100	Fiber and Paper Technology; Personal Assignment	10
BJ60A1300	Usage and Properties of Paper	5
BJ60A1400	Chemical Pulping Technology	5
BJ60A1500	Fiber and Paper Basics	4
BJ90A0400	Catalysis	4
BJ90A0710	Chemical Separation Methods	4
BJ90A0720	Chemical Separation Methods	8
BJ90A1100	Hydrometallurgy	4

BJ10A0001	LABORATORY WORK COURSE IN CHEMICAL TECHNOLOGY	10 - 30 ECTS cr
	Laboratory Work Course in Chemical Technology	
	The course is mainly intended for foreign visiting students. The students register for the course by contacting the supervisor.	
Teacher(s)	N. N. Person in Charge: Head of the Laboratory	
Aims	To give the student a deeper understanding on chemical technology in a specialized area.	
Content	A specific project which is done in one of the laboratories of the department. The project is planned together with the supervisor(s) and consists mainly of laboratory work, literature work and report writing. The course may contain lectures and seminars. The project may also be planned together with industry and then carried out at some industrial location.	
Modes of Study	The amount of work hours in the project will determine the amount of credits, e.g. three months of work would give 15 ECTS cr. Credits will be granted when the final report is delivered. Extra credits can be received if specific examinations are made.	
Evaluation	0-5 or pass/fail, depending on the project carried out.	
Study materials	Literature related to the project.	
BJ10A0201	MASTER'S THESIS AND SEMINAR	30 ECTS cr
	Diplomityö ja seminaari	
Year and Period	M.Sc. (Tech.) 2, Period 1-4	
Teacher(s)	Professor of the major subject.	
Aims	The Master's thesis is the final project of the Master's degree, which demonstrates the student's knowledge of a topic of scientific or societal importance in the professional field in question.	
Content	The thesis is a research or planning project. Students must demonstrate the ability to complete the project independently and following a plan. A report is prepared following the instructions for the Master's thesis.	
Modes of Study	The thesis is connected to a seminar with other thesis students and their instructors. Each student gives a brief presentation on the results of his/her project. The presentations are then discussed, and teachers pose questions on them to the entire group.	
Evaluation	0-5, Master's thesis 100%.	
BJ10A0400	PROCESS CONTROL SYSTEMS IN PULP AND PAPER INDUSTRY	3 ECTS cr
	Process Control Systems in Pulp and Paper Industry	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Lic.Sc. (Tech.) Merja Mäkelä Professor, Ph.D. Andrzej Kraslawski (contact person)	
Content	Processes and instrumentation. Need of measurements, open loop and closed loop control. Distributed control systems, programmable logic controllers and open control networks. Communication from process sensors, transmitters and actuators to control rooms. Process plant visualization and control room operation. System configuration, engineering and documentation. Single-input, single-output and multiple-input, multiple-output control strategies. Use of PID, fuzzy logic, model predictive and optimization control principles. Paper and board quality online measurement and control. Automation in original and renewal plant investment projects. Maintenance and innovative development in automation.	

Modes of Study	Lectures 16 h, 1st period. Lectures 12 h, 2nd period.
Evaluation	Individual or team project work with supervision 12 h, 2nd period.
Study materials	0-5, written examination 60%, project work 40%. Learning Environment for Papermaking and Automation, KnowPap, Licentia 2004, Espoo Finland. Learning Environment for Chemical Pulping and Automation, KnowPulp, Licentia 2004, Espoo Finland. Matlab-Simulink simulation environment, Process Control, System Identification and Fuzzy Control toolboxes, Mathworks 1984 - 2004. Leiviskä, K., Process control, Book 14, in Papermaking Science and Technology, Fapet, 1999, 297 p., ISBN 952-5216-00-4. Sell, Nancy J., Process Control Fundamentals for the Pulp and Paper Industry, Tappi, 1995, Atlanta, USA, 612 p., ISBN 0-89852-294-3.

BJ10A0500	CROSS-CULTURAL COMMUNICATION FOR WORKING LIFE 2 ECTS cr
	Cross-Cultural Communication for Working Life
Year and Period	M.Sc. (Tech.) 1, Period 3
Teacher(s)	M.Sc. (Tech.) Mark Middleton Professor, Ph.D. Andrzej Kraslawski (contact person)
Aims	To provide students knowledge about problems arising in industrial working environments due to ineffective communication.
Content	Information exchange and understanding the viewpoints of parties involved. Effective communication, how to understand attitudes, values and danger areas. Cultural aspects and linguistic tools for goal-oriented communication. Project management, negotiations, presentations and resolution of dispute situations.
Modes of Study	Intensive course. Lectures 16 h, exercises 16 h, 3rd period. No examination. The number of participants is limited. Priority is given to the students of the Master's Degree Programme in Chemical and Process Engineering (IPPE).
Evaluation	Pass/Fail. Active participation in lectures and exercises.

BJ20A0301	INTRODUCTION TO PROCESS SIMULATION 5 ECTS cr
	Introduction to Process Simulation
Year and Period	B.Sc. (Tech.) 3, Period 1-2
Teacher(s)	Lecturer, D.Sc. (Tech.) Ritva Tuunila
Aims	The student will learn basics of process simulation and is capable to simulate simple chemical and paper processes with suitable commercial simulators.
Content	Theoretical basics of steady state process simulation, calculation of mass and energy balances by using commercial simulators (ASPEN, BALAS).
Modes of Study	Lectures and exercises 28 h, 1st period. Lectures and exercises 28 h, 2nd period. Individual assignments 40 h.
Evaluation	0-5, exam 80%, passed assignments 20%.
Study materials	Course notes.

BJ20A0800	TREATMENT PROCESSES OF INDUSTRIAL DISCHARGES 5 ECTS cr
	Treatment Processes of Industrial Discharges
Year and Period	B.Sc. (Tech.) 3, Period 3-4
Teacher(s)	Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen Docent, Ph.D. Sergei Preis

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Aims	To familiarize students with engineering solutions of environmental problems concerning water and wastewater treatment, air emissions control and solid waste processing and disposal.
Content	The course includes three main parts: basics in water and wastewater treatment, treatment of air polluted with particulate and gaseous matter, and solid waste handling and disposal. Water and wastewater treatment part considers basic methods in water treatment: sedimentation, coagulation/flocculation, filtration, biological treatment, sludge disposal and disinfection. Air treatment part concentrates on dust removal and gaseous pollutant abatement. Solid waste treatment concentrates on the processing techniques: volume reduction, materials recovery, incineration and energy recovery.
Modes of Study	Lectures and exercises 21 h, 3rd period. Lectures and exercises 21 h, 4th period.
Evaluation	0-5, written examination 100%.
Study materials	Peavy, H.S., Rowe, D.R., Tchobanoglous, G., Environmental Engineering, McGraw-Hill, 1st ed., 1985.
Prerequisites	Recommended: BJ20A1400 Partikkeliteknikka ja kiintoaineiden käsittely BH40A1400 Virtaustekniikka I BJ20A0100 Mekaaniset erotusmenetelmät BH40A0250 Pumput, puhaltimet ja kompressorit (Kete) BJ20A1600 Kemianteekniikan yksikköoperaatiot I

BJ20A1100	FILTRATION AND MIXING	6 ECTS cr
	Filtration and Mixing	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, M.Sc. (Tech.) Antti Häkkinen Lecturer, D.Sc. (Tech.) Ritva Tuunila Docent, D.Sc. (Tech.) Tuomas Koironen Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen	
Aims	To familiarize students with solid-liquid separation techniques and mixing processes.	
Content	The topics are as follows: Filtration: fundamentals of filtration, filtration methods, operation of filters, cake formation and washing, deliquoring, design and modeling of filters. Mixing: fundamentals of mixing, rheology, mixing equipment, design of mixers and scale-up.	
Modes of Study	Lectures 14 h, exercises 14 h, 3rd period. Lectures 14 h, exercises 14 h, 4th period. Laboratory work and reports.	
Evaluation	0-5, written examination 100%, reports passed.	
Study materials	Additional material will be informed at lectures.	
Prerequisites	BJ20A0100 Mekaaniset erotusmenetelmät passed.	

BJ20A1800	CHEMICAL ENGINEERING UNIT OPERATIONS II B	5 ECTS cr
	Chemical Engineering Unit Operations II B	
	Replaces the courses BJ20A0500 Chemical Engineering Unit Operations II and BJ20A0600 Chemical Engineering Unit Operations III.	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen Senior Lecturer, D.Sc. (Tech.) Harri Niemi	
Aims	To familiarize students with separation techniques and the theory of mass transfer more extensively than in the course BJ20A1600 Kemianteekniikan	

Content	yksikköoperaatiot I. The topics are as follows: 1. Membrane separation: Mass transfer, modelling, process design, simulation of industrial membrane processes. 2. Industrial crystallization: theory, operation and design of crystallizers. 3. Multicomponent mass transfer: differences between mass transfer in binary and multicomponent systems, basic theory and examples in evaporation, distillation, desorption, membrane separation, heterogeneous reaction, etc.
Modes of Study	Lectures 18 h, exercises 42 h, laboratory work, 1st-2nd period.
Evaluation	0-5, written examination 100%, reports passed.
Study materials	Davey, R. J., Garside, J., From Molecules to Crystallizers, Oxford, Oxford University Press, 2000.
Prerequisites	Lecture notes. BJ20A1600 Kemiantechniikan yksikköoperaatiot I and BJ80A1000 Kemiallinen termodynamiikka passed.

BJ20A1900	ADVANCED COURSE IN ENVIRONMENTAL TECHNOLOGY AND UNIT OPERATIONS 8 ECTS cr
	Advanced Course in Environmental Technology and Unit Operations
	Replaces the courses BJ20A0900 Yksikköoperaatioiden seminaari and BJ20A1000 Advanced Course in Environmental Technology.
Year and Period	M.Sc. (Tech.) 1, Period 3-4,1
Teacher(s)	N. N. Professor, M.Sc. (Tech.) Antti Häkkinen Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen Senior Lecturer, D.Sc. (Tech.) Harri Niemi Lecturer, D.Sc. (Tech.) Ritva Tuunila
Content	"Green chemistry" in technology and in treatment of industrial and municipal wastes. Unit operation applications. Design of experiments.
Modes of Study	Lectures 14 h, 3rd period. Exercises and seminars 28 h, 4th and 1st period. Literature work, experimental or simulation work, report and seminar presentation.
Evaluation	0-5, written examination 30%, report and seminar 70%.
Study materials	Lecture notes.

BJ30A0500	PROJECT ON PROCESS AND PLANT DESIGN 11 ECTS cr
	Project on Process and Plant Design
	HUOM! Suomenkielisille työryhmille opintojakso opetetaan suomeksi.
Year and Period	M.Sc. (Tech.) 2, Period 1-2
Teacher(s)	Professor, D.Sc. (Tech.) Ilkka Turunen
Aims	The purpose is to make students familiar with process and plant design with the help of an extensive project work.
Content	The projects are carried out in groups of five students. The topics are from industry. A typical topic is a feasibility study of a process covering a brief market survey, comparison of process alternatives, preliminary process design (process flowsheet, mass and energy balances, sizing of main equipment), layout, cost and profitability estimation. Different aspects are emphasized in different projects, depending on the topic. Suitable also for postgraduate studies.
Modes of Study	Lectures 5 h, project meetings, 1st period. Lectures 5 h, project meetings, 2nd period. Design and project work about 280 h, 1st-2nd period. No examination.

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Evaluation	0-5, design reports 100%.	
Prerequisites	BJ30A0302 Prosessi- ja tehdassuunnittelu passed. Recommended BJ30A0400 Prosessisuunnittelun seminaari.	
BJ30A0700	COMPUTATIONAL FLUID DYNAMICS IN CHEMICAL ENGINEERING	6 ECTS cr
	Computational Fluid Dynamics in Chemical Engineering	
Year and Period	M.Sc. (Tech.) 2, Period 2	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	To teach students to use CFD to solve chemical engineering problems, e.g. in equipment design and trouble shooting.	
Content	Theoretical basis of CFD. Introduction of CFX software. Applications of CFD in process industry. Solving chemical engineering problems with CFD.	
Modes of Study	Lectures 28 h, 2nd period. Exercises with CFD software 120 h, 2nd period. Seminar presentation. No examination.	
Evaluation	0-5, seminar presentation 70%, exercise report 30%. At least 90% presence at lectures required.	
Study materials	To be announced later.	
BJ30A1401	PROCESS AND PRODUCT INNOVATIONS	10 ECTS cr
	Process and Product Innovations	
	Mainly for Finnish and international students from the departments of Chemical Technology, Mechanical Engineering, Electrical Engineering and Industrial Engineering and Management. The number of participants is limited and the applicants will be interviewed.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-4	
Teacher(s)	Professor, D.Sc. (Tech.) Tuomo Kässi Senior Lecturer, D.Sc. (Tech.) Ville Ojanen Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	To get acquainted with the generation of innovations and new technology, the typical methods, problems and their solutions. To train project and teamwork in interdisciplinary, international environment. To get acquainted with product and process development. To train and deepen many skills learned in other connections.	
Content	Methods of product and process development. Interdisciplinary R & D activities as project and teamwork. Development of new technology, patenting. Suitable also for postgraduate studies.	
Modes of Study	Informational lectures, 6 h/period. Project meetings, 6 h/period. Independent project and teamwork in groups of 4-8 students.	
Evaluation	0-5, project work 100%.	
BJ30A1600	ADVANCED PROCESS SIMULATION	8 ECTS cr
	Advanced Process Simulation	
	Replaces the courses BJ30A1500 Advanced Process Simulation and BJ40A0200 Basic Process Simulation.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Yury Avramenko Person in Charge: Professor, Ph.D. Andrzej Kraslawski	
Aims	To make students able to apply simulation for processes development, design,	

Content	retrofit and operation. Introduction to process modelling and design. Overview of existing software. Practice in use of ASPEN and BALAS-software. Examples of simulation cases for process development, design, retrofit and optimisation of flowsheets. Suitable also for postgraduate studies.
Modes of Study	Lectures and exercises 42 h, 3rd-4th period. Project work 120 h.
Evaluation	0-5, project 60%, class work 40%.
Prerequisites	BJ20A0301 Introduction to Process Simulation

BJ40A0000	CREATIVE DESIGN	3 ECTS cr
	Creative Design	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, Ph.D. Andrzej Kraslawski	
Content	Types of innovation. Product, process, service innovation. Innovations in process engineering. Models of creativity. Enhancement of creativity (brainstorming, synectics, morphological analysis, case-based reasoning, quality function deployment, TRIZ).	
Modes of Study	Lectures and exercises 56 h, 1st period.	
Evaluation	0-5, written examination 50%, exercises and presence at the lectures 50%.	
Study materials	Lecture notes.	

BJ40A0100	PRODUCT DESIGN	5 ECTS cr
	Product Design	
Year and Period	M.Sc. (Tech.) 1, Period 4	
Teacher(s)	Professor, Ph.D. Andrzej Kraslawski	
Content	Types of products. Identification of consumer needs. Product functional and physical-chemical properties. High-throughput experiments. Knowledge-based systems for product design. Computer-aided product design.	
Modes of Study	Lectures 15 h, exercises 20 h, 4th period.	
Evaluation	0-5, written examination 50%, exercises and presence at the lectures 50%.	
Study materials	Lecture notes.	

BJ50A0400	ADVANCED COURSE IN MEMBRANE TECHNOLOGY AND TECHNICAL POLYMER CHEMISTRY	10 ECTS cr
	Memraanitekniiikan ja teknillisen polymeerikemian syventävä opintojakso	
	The course will be given in English if required.	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Mika Mänttari Researcher/Teacher, D.Sc. (Tech.) Arto Pihlajamäki	
Aims	Advanced studies in membrane technology, technical polymer chemistry and pulp and paper technology as well as project-like research work and its reporting.	
Content	Membrane processes and their special characters, optimization and characterization of materials. Exploitation of polymeric materials. Yearly changing project subjects.	
Modes of Study	Lectures, seminars and personal guidance 21 h, 1st period. Lectures, seminars and personal guidance 21 h, 2nd period. Personal research project 165 h, 1st–2nd period. Lectures, laboratory work, seminar lectures and possibly a test. Obligatory seminars.	

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Evaluation	Enrolling to the course using the WebOodi but also in the laboratory's noticeboard preferably on preceding spring. 0-5, personal laboratory research work 25%, seminars 75%.	
BJ60A1000	FIBER AND PAPER TECHNOLOGY; PERSONAL ASSIGNMENT	6 ECTS cr
	Fiber and Paper Technology; Personal Assignment	
	Replaces the course BJ60F0300 Fiber Technology; Personal Assignment. Opintojakson voi suorittaa joko englannin tai suomen kielellä.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4/1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Isko Kajanto Professor, M.Sc. (Tech.) Kaj Henricson Professor, D.Sc. (Tech.) Jari Käyhkö Senior Lecturer, Lic.Sc. (Tech.) Kati Turku Assistant, M.Sc. (Tech.) Mika Pulkkinen	
Aims	To give the student a deeper understanding of a specialized area of fiber, paper or coating technology or paper chemistry and to give the student training in working independently on a specified subject and to provide the readiness for writing a scientific literature report.	
Content	An individual and independent literature work and seminar on fiber, paper or coating technology or paper chemistry. Suitable also for postgraduate studies.	
Modes of Study	The course is held both during the autumn and the spring semester. Literature work 3rd-4th period/1st-2nd period. Seminar 4th/2nd period. Registration with WebOodi but also required to register at the bulletin board of the Laboratory of Paper Technology.	
Evaluation	0-5, literature work and seminar 100%.	
Study materials	Literature related to the project. Course material.	
Prerequisites	BJ60A0001 Paperitekniiikan perusteet or BJ60A1500 Fiber and Paper Basics and BJ60A0900 Kuidun ja paperin valmistus (attended) or corresponding knowledge. BJ80A0500 Pinta- ja kolloidikemia is recommended.	
BJ60A1100	FIBER AND PAPER TECHNOLOGY; PERSONAL ASSIGNMENT	10 ECTS cr
	Fiber and Paper Technology; Personal Assignment	
	Replaces the course BJ60A0301 Paperitekniiikan erikoistyö. Opintojakson voi suorittaa joko englannin tai suomen kielellä.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4/1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Isko Kajanto Professor, M.Sc. (Tech.) Kaj Henricson Professor, D.Sc. (Tech.) Jari Käyhkö Senior Lecturer, Lic.Sc. (Tech.) Kati Turku Assistant, M.Sc. (Tech.) Mika Pulkkinen	
Aims	To give the student a deeper understanding of a specialized area of fiber, paper or coating technology or paper chemistry and to acquaint the student with the independent experimental work and result analysis involved in product and process development and to provide the readiness for the preparation of a scientific report.	
Content	An individual and independent assignment on fiber, paper or coating technology or paper chemistry including literature and experimental part. A seminar presentation is to be given on the assignment. Suitable also for postgraduate studies.	
Modes of Study	The course is held both during the autumn and the spring semester.	

Evaluation	Assignment including ca. 200 h practical work and a final report, 3rd-4th period/1st-2nd period.
Study materials	Seminar 4th/2nd period. Registration with WebOodi but also required to register at the bulletin board of the Laboratory of Paper Technology. 0-5, final report and seminar 100%.
Prerequisites	Literature related to the project. Course material. BJ60A0001 Paperitekniiikan perusteet and BJ60A0800 Kuitu- ja paperitekniiikan laboratoriotyöt or BJ60A1500 Fiber and Paper Basics and BJ60A0900 Kuidun ja paperin valmistus (attended) or corresponding knowledge. BJ80A0500 Pinta- ja kolloidikemia is recommended.

BJ60A1300	USAGE AND PROPERTIES OF PAPER	5 ECTS cr
	Usage and Properties of Paper	
	Replaces the course BJ60A0251 Paperin jalostus ja käyttö.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Isko Kajanto Assistant, M.Sc. (Tech.) Mika Pulkkinen Visiting lecturer(s)	
Aims	Understanding how the properties of paper are linked to its structure and its manufacturing process. Knowledge of printing methods.	
Content	Paper physics: fibrous networks, paper strength, interaction of water with paper, dimensional stability. Improvement of surface properties of paper: coating and calendering. Printing methods: offset, gravure, inkjet, electrophotography. Interactions with printing ink and the paper surface. Paperboard packaging and converted paper products. Future trends. Possible mill visit.	
Modes of Study	Lectures 28 h, 3rd period. Lectures 28 h, 4th period. Seminar presentations. Exam.	
Evaluation	0-5, examination 70%, seminar work 30%.	
Study materials	Lecture material. Named parts of the books: Gullichsen, J., Paulapuro, H. (eds), Papermaking Science and Technology, Fapet Oy, vol. 11, vol. 12, vol. 13, vol. 16.	
Prerequisites	Knowledge of paper technology. BJ80A0500 Pinta- ja kolloidikemia is recommended.	

BJ60A1400	CHEMICAL PULPING TECHNOLOGY	5 ECTS cr
	Chemical Pulping Technology	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, M.Sc. (Tech.) Kaj Henricson Research Assistant, M.Sc. (Tech.) Tiina Nokkanen	
Aims	To familiarize the students with the process and equipment technology used in the manufacture of chemical pulp and the recovery of cooking chemicals and in bio-refineries combined with chemical pulp mills. To develop understanding of mill emissions, energy and mass balances.	
Content	Machinery and processes used in the fiberline with special focus on the sulfate process. Recovery of cooking chemicals and mill energy systems. Alternative cooking methods. Bio-refineries in combination with pulp mills. Mill emissions related to the manufacture of chemical pulp. Available wood resources. Properties of chemical fibers. Suitable also for postgraduate studies.	
Modes of Study	Lectures, exercises and seminars 14 h, 1st period. Lectures, exercises and seminars 14 h, 2nd period. Blackboard-support.	

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Evaluation	Lectures, personal assignment and seminars. 0-5, written examination 75%, personal assignment 25%.
Study materials	Gullichsen, J., Paulapuro, H. (eds), vol. 1 (1998), vol. 3 (2000), vol. 6A (1999), vol. 6B (1999), Papermaking Science and Technology, Fapet Oy. Sixta, H., Handbook of Pulp, Volume 1 and 2, Wileys - VCH (2006). Dence, C., Reeve, D. (eds), Pulp Bleaching - Principles and Practice, Tappi Press (1996). Adams, Terry N. et. al., Kraft Recovery Boilers, Tappi Press (1997). Vakkilainen, Esa K., Kraft Recovery Boilers: Principles and Practice, Suomen Soodakattilayhdistys (2005). Blackboard course material, handouts and other specified reading.
Prerequisites	BJ60A0900 Kuidun ja paperin valmistus or BJ60A1500 Fiber and Paper Basics attended or corresponding knowledge of forest industry.

BJ60A1500	FIBER AND PAPER BASICS	4 ECTS cr
	Fiber and Paper Basics	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Isko Kajanto Professor, M.Sc. (Tech.) Kaj Henricson TkT Päivi Rousu Senior Lecturer, Lic.Sc. (Tech.) Kati Turku Assistant, M.Sc. (Tech.) Mika Pulkkinen DI Tomi Hietanen	
Aims	To give students an overview of fibermaking and papermaking processes and properties of paper and board. To introduce the student to the laboratory work and methods of analysis used in the paper industry.	
Content	Chemical and mechanical pulp, DIP. Papermaking fibres: Structure, interactions with water and bonding. Filtration of fibre suspension and flow properties. Papermaking processes: Defibration and refining of pulp, web forming, web pressing, drying and coating. Structure and properties of paper web. Paper and board grades. Sheet making and analytics of paper laboratory. Pulp and paper testing exercises in pairs.	
Modes of Study	Lectures 21 h, 1st period. Guided laboratory work 30 h and report, 1st-2nd period. Support on web-based learning environment platform (Blackboard).	
Evaluation	0-5, exam 100%. Laboratory work pass/fail.	
Study materials	Course material on Blackboard. Other literature given on lectures.	

BJ90A0400	CATALYSIS	4 ECTS cr
	Catalysis	
	The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Erkki Paatero	
Aims	The course gives the theoretical basis for homogeneous and heterogeneous catalysts and how they work in chemical reactors.	
Content	The focus during the course is on the structures, properties and applications of heterogeneous catalysts. Homogeneous and enzyme catalysts are briefly described. The mechanisms of catalytic reactions and the derivation of rate expressions. How to choose the catalyst and the reactor. Applications in environmental engineering. Suitable also for postgraduate studies.	
Modes of Study	Intensive course. Lectures and exercises 28 h, 1st-2nd period. Laboratory demonstration and homework.	
Evaluation	0-5, written examination 100%, homework passed.	

Study materials	Thomas, J.M. & Thomas, W.J., Principles and Practice of Heterogeneous Catalysis, John Wiley & Sons, Inc., 1997.
Prerequisites	BJ90A1000 Luonnonvarat ja niiden prosessointi kemian- ja energiateollisuudessa passed.

BJ90A0710	CHEMICAL SEPARATION METHODS	4 ECTS cr
	Chemical Separation Methods	
	The lectures are included as a part in BJ90A0200 Teknillinen kemia.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Erkki Paatero Senior Assistant, D.Sc. (Tech.) Kimmo Klemola Researcher/Teacher, D.Sc. (Tech.) Tuomo Sainio	
Aims	The course gives the theoretical basis for chemically assisted separation methods.	
Content	The focus during the course is on the chemistry involved in the application of solvent extraction, ion-exchange, adsorption, chromatographic separation and flotation. Applications of these technologies are found widely in industry although mostly in hydrometallurgy, food industry and pharmaceutical industry. Suitable also for postgraduate studies.	
Modes of Study	Intensive course. Lectures and seminars 28 h, 3rd period. Lectures and seminars 7 h, 4th period. Oral presentation of a literature study.	
Evaluation	Oral or written examination. 0-5, examination 100%.	

BJ90A0720	CHEMICAL SEPARATION METHODS	8 ECTS cr
	Chemical Separation Methods	
	The lectures are included as a part in BJ90A0200 Teknillinen kemia.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Erkki Paatero Senior Assistant, D.Sc. (Tech.) Kimmo Klemola Researcher/Teacher, D.Sc. (Tech.) Tuomo Sainio	
Aims	The course gives the theoretical basis for chemically assisted separation methods.	
Content	The focus during the course is on the chemistry involved in the application of solvent extraction, ion-exchange, adsorption, chromatographic separation and flotation. Applications of these technologies are found widely in industry although mostly in hydrometallurgy, food industry and pharmaceutical industry.	
Modes of Study	Intensive course. Lectures and seminars 28 h, 3rd period. Lectures and seminars 7 h, 4th period. Oral and written presentation of a literature study. Laboratory work of approximately 40 h.	
Evaluation	Oral or written examination. 0-5, examination 70%, seminar 30%.	

BJ90A1100	HYDROMETALLURGY	4 ECTS cr
	Hydrometallurgy	
	The course will be lectured every second year, next time during the academic year 2009 - 2010.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Erkki Paatero	
Aims	The course gives the theoretical basis for hydrometallurgy and the technology applied in hydrometallurgical processes.	
Content	Solution chemistry in metallurgical solutions and use of the Eh-pH diagram. Leaching and treatment of leach solutions by adsorption, ion exchange, solvent extraction and precipitation. Electrochemical methods.	
Modes of Study	Intensive course. Lectures and exercises 28 h, 1st-2nd period.	
Evaluation	0-5, written examination 100%, exercises passed.	
Study materials	Fathi Habashi, Textbook of Hydrometallurgy, Metallurgie Extractive Quebec, 2nd edition, 1999.	

4.3. Master's Degree Programme in Electrical Engineering

The Master's degree programme in Electrical Engineering is structured around a series of subject specific study programs. The Master's degree programme provides training in the major subjects in

- Industrial Electronics
- Electricity Distribution and Market

Within these majors the student is given the opportunity to specialize in the subject area of his interest.

The Aims of the Master's Degree Programme

The programme is specifically aimed at students who wish to receive multiple and goal-directed training in electrical engineering technology. It focuses on preparing students to be professionally and academically prepared to address the needs of international entrepreneurial companies seeking for networking opportunities in a globalizing market.

Our aim is to educate industrially orientated, world-class professionals with firm theoretical understanding and profound expertise in the following fields of specialization:

- Industrial Electronics – includes subject studies in electrical drives technology and control engineering, focusing on the management of electromagnetism, power electronics, electromechanical and electrothermal processes, on industrial applications of real-time control systems, embedded software, digital signal processing, and on the application of these to the modeling and control of electric drives and power electronics.
- Electricity Distribution and Market - focuses on studies in electricity distribution automation and power transmission, network business technology, regulation, and economy.

The Degree Structure of the Programme

Depending on the degree and/or on the level and extent of studies the student has obtained from home university and based on the student's field of interest and specialization, **a personal study plan will be composed for every admitted student.** The personal study plan in electrical engineering is structured of following subject blocks:

Master of Science (Technology)	Master's Degree Programme in Electrical Engineering 120 ECTS cr		
	Master's Thesis on major subject 30 ECTS cr		Minor subject 20-22 ECTS cr
	General studies 21 ECTS cr Major in Industrial Electronics 32 ECTS cr	General studies 21 ECTS cr Major in Electricity Distribution and Market 31 ECTS cr	
	Select a major subject and a minor subject		Elective studies 16-18 ECTS cr

The recommended major and minor subject combination is shown in the table below. However, the student may choose any of the minor subjects offered by LUT Energy (Bio-Energy Technology, Environmental Energy Technology, Industrial Embedded Systems or Power Electronics and Electrical Drives).

Subject Combination	
Major Subject	Minor Subject
Industrial Electronics	Industrial Embedded Systems
Electricity Distribution and Market	Power Electronics and Electrical Drives

Industrial Electronics

The person responsible for major in Industrial Electronics is professor, D.Sc. (Tech.) Juha Pyrhönen

General Studies 21 ECTS cr

<i>Obligatory (21 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AB30A0300 International Finance and Emerging Markets	M.Sc. (Econ. & Bus. Adm.) 1	2	5
BM20A1300 Complex Analysis	M.Sc. (Tech.) 1-2	1	3
BM20A2701 Numerical Methods II	M.Sc. (Tech.) 1	4	3
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3 M.Sc. (Tech.) 1-2	1, 2, 3, 4	2
	B.Sc. (Econ. & Bus. Adm.) 2-3 M.Sc. (Econ. & Bus. Adm.) 1-2		
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3 M.Sc. (Tech.) 1-2	1-2, 3-4	4
	B.Sc. (Econ. & Bus. Adm.) 3 M.Sc. (Econ. & Bus. Adm.) 1-2		
FV18A9101 Finnish 1		1, 3	2
FV18A9201 Finnish 2		2, 4	2

Major Subject 62 ECTS cr

<i>Obligatory Studies (62 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH50A1200 Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BL30A0400 Design of an Electrical Machine	M.Sc. (Tech.) 1	1	6
BL30A0600 Power Electronics	M.Sc. (Tech.) 1	1-2	6
BL30A1010 Seminar Course in Electrical Drives	M.Sc. (Tech.) 1	1	4
BL30A1200 Numerical Methods in Electromagnetism	M.Sc. (Tech.) 2	3	4
BL40A1100 Embedded System Programming	M.Sc. (Tech.) 1	1-2	4
BL50A0600 Electromagnetic Compatibility in Power Electronics	M.Sc. (Tech.) 1	1	2
Thesis			30

Minor Subject 21 ECTS cr

<i>Industrial Embedded Systems (21 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BL40A1000 Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1200 Digital Control Design	M.Sc. (Tech.) 1	1-2	4
BL40A1810 Microprocessors A	B.Sc. (Tech.) 3	3-4	6
BL50A1300 Advanced Course in Electronics	M.Sc. (Tech.) 1	3-4	6

Elective Studies 16 ECTS cr

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise.

Electricity Distribution and Market

The person responsible for major in Industrial Electronics is professor, D.Sc. (Tech.) Jarmo Partanen

General Studies 21 ECTS cr

<i>Obligatory (21 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AB30A0300 International Finance and Emerging Markets	M.Sc. (Econ. & Bus. Adm.) 1	2	5
BM20A1300 Complex Analysis	M.Sc. (Tech.) 1-2	1	3
BM20A2701 Numerical Methods II	M.Sc. (Tech.) 1	4	3
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3	1, 2,	2
	M.Sc. (Tech.) 1-2	3, 4	
	B.Sc. (Econ. & Bus. Adm.) 2-3		
	M.Sc. (Econ. & Bus. Adm.) 1-2		
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3	1-2,	4
	M.Sc. (Tech.) 1-2	3-4	
	B.Sc. (Econ. & Bus. Adm.) 3		
	M.Sc. (Econ. & Bus. Adm.) 1-2		
FV18A9101 Finnish 1		1, 3	2
FV18A9201 Finnish 2		2, 4	2

Major Subject 61 ECTS cr

<i>Obligatory Studies (61 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH50A1200 Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BH60A2000 Emission Trading	B.Sc. (Tech.) 3	3-4	3
BL20A0201 Power Exchange Game for Electricity Markets	M.Sc. (Tech.) 1	2-3	3
BL20A0401 Electricity Market	M.Sc. (Tech.) 1	1	5
BL20A0501 Electricity Distribution Technology	M.Sc. (Tech.) 1	2-3	8
BL30A0600 Power Electronics	M.Sc. (Tech.) 1	1-2	6
Thesis Master's Thesis and Seminar			30

Minor Subject, Power Electronics and Electrical Drives

<i>Select a minimum of 20 ECTS cr</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BL30A1010 Seminar Course in Electrical Drives	M.Sc. (Tech.) 1	1	4
BL30A1200 Numerical Methods in Electromagnetism	M.Sc. (Tech.) 2	3	4
BL40A1100 Embedded System Programming	M.Sc. (Tech.) 1	1-2	4
BL40A1810 Microprocessors A	B.Sc. (Tech.) 3	3-4	6
BL50A0600 Electromagnetic Compatibility in Power Electronics	M.Sc. (Tech.) 1	1	2
BL50A1300 Advanced Course in Electronics	M.Sc. (Tech.) 1	3-4	6

Elective Studies 18 ECTS cr

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise.

Additional Information

Personal Study Plans

At the beginning of their studies, students prepare a personal study plan, in which the student and the contact persons of the degree programme agree on what studies the student will pursue and in what order. This plan includes detailed information on the major subject, minor subject, general studies, elective studies, credit transfer from previous degree/studies and possible complementary studies.

Credit Transfers

ECTS credits can be transferred from the student's previous university level studies or higher university degrees from Finnish or foreign universities. More information on credit transfer is available from Study Coordinator.

Complementary Studies (20-60 ECTS cr)

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree. The course FV13A1200 Teknisk svenska 2 ECTS cr is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.

Further Information

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The Courses Offered in English

		<i>ECTS cr</i>
BL20A0201	Power Exchange Game for Electricity Markets	3
BL20A0401	Electricity Market	5
BL20A0501	Electricity Distribution Technology	8
BL20A0601	Electrical Power Transmission	5
BL30A0400	Design of an Electrical Machine	6
BL30A0600	Power Electronics	6
BL30A1010	Seminar Course in Electrical Drives	4
BL30A1200	Numerical Methods in Electromagnetism	4
BL40A1000	Real-time Operating Systems and Programs	5
BL40A1100	Embedded System Programming	4
BL40A1200	Digital Control Design	4
BL40A1810	Microprocessors A	6
BL40A2201	Process and Product Innovations	10
BL50A0600	Electromagnetic Compatibility in Power Electronics	2
BL50A1300	Advanced Course in Electronics	6

<i>BL20A0201</i>	<i>POWER EXCHANGE GAME FOR ELECTRICITY 3 ECTS cr MARKETS</i>
	Power Exchange Game for Electricity Markets
Year and Period	M.Sc. (Tech.) 1, Period 2-3
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Jarmo Partanen
Aims	The course deepens the student's knowledge of the practical planning and implementation of electricity trade in the form of game training.
Content	Planning of the procurement and sale of electricity, OTC markets, physical and financial products of power exchange, risk management on the electricity markets. Suitable also for postgraduate studies.
Modes of Study	8 h of lectures, 40 h of game training that is carried out once a week in teams, 2nd and 3rd period. A final report in writing.
Evaluation	0 - 5, final report in writing 100%
Study materials	Material to be distributed during the lectures.
Prerequisites	Electricity market

<i>BL20A0401</i>	<i>ELECTRICITY MARKET</i>	<i>5 ECTS cr</i>
	Electricity Market	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Satu Viljainen	
Aims	The course gives the student a basic knowledge of the fundamentals of electricity trade and the electricity distribution business as well as of the related objectives and implementations.	
Content	The development of electricity markets, loads on the electricity network and load forecasts, power exchange, electricity trade, balance management, the fundamentals of pricing and the regulation of distribution business.	
Modes of Study	28 h of lectures, 14 h of tutorials, 1st period. Independent studies. Written examination.	
Evaluation	0 - 5, examination 100%.	
Study materials	Material to be distributed during the lectures.	

BL20A0501	ELECTRICITY DISTRIBUTION TECHNOLOGY	8 ECTS cr
	Electricity Distribution Technology	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Teacher(s)	Research engineer M.Sc.(Tech.) Jukka Lassila Person in Charge: Professor, D.Sc. (Tech.) Jarmo Partanen	
Aims	The course provides the student with in-depth knowledge of the design and use of distribution networks.	
Content	Network design; the use, protection, and automation of distribution networks; information systems of distribution companies.	
Modes of Study	42 h of lectures, 28 h of tutorials, 2nd and 3rd period. Assignment. Written examination.	
Evaluation	0 - 5, examination 100%. Satisfactorily completed assignment required.	
Study materials	Lakervi, Holmes: Electricity distribution network design.	
Prerequisites	Students are required to have completed Introduction to Electrical Power Systems, Electrical Power Transmission, and have attended the lectures of Electricity Market.	
BL20A0601	ELECTRICAL POWER TRANSMISSION	5 ECTS cr
	Electrical Power Transmission	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Jarmo Partanen	
Aims	This course provides the student with a basic knowledge of the design and use of electricity transmission networks.	
Content	The description of the electricity transmission system. Frequency and voltage control. Calculation of load flow, fault currents and stability in a meshed network. DC power transfer. Relay protection.	
Modes of Study	24 h of lectures, 14 h of tutorials, 2nd period. Written examination.	
Evaluation	0 - 5, examination 100%.	
Study materials	Kothari, Nagrath: Modern Power System Analysis	
Prerequisites	Students are required to have completed Electric Circuits and attended the lectures of Introduction to Electrical Power Systems.	
BL30A0400	DESIGN OF AN ELECTRICAL MACHINE	6 ECTS cr
	Design of an Electrical Machine	
	Suomenkielinen opetusmoniste sekä suomenkieliset harjoitustehtävät ovat saatavilla.	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Juha Pyrhönen	
Aims	The course will give the student professional knowledge of the design of an electric machine and basic skills required in finding structural solutions based on desired machine characteristics. The students are trained to perform design tasks, to utilize mathematical software in calculation, and to analyze the machine characteristics. Students are also acquainted with materials used in machines, heat transfer and some basic mechanical aspects of the machine design. After having successfully passed the course a student should be capable of further educating him- or herself to work as a motor or generator designer or in the field of motor drives in general. The course may be applied in post graduate studies.	
Content	Electro magnetic principles used in machine design, the magnetic circuit of an electric machine, the windings of an electric machine, impacts of the structure of the electric motor on the motor characteristics, calculation of the parameters of an equivalent circuit from the dimensions of the machine (resistances,	

Modes of Study	inductances), effective-value phasor diagrams for different machine types, principles of electric machine design, insulation materials and systems heat transfer. Suitable also for postgraduate studies. 28 h of lectures, 28 h of tutorials, 1st period.
Evaluation	The design assignment of an electric machine. Written examination.
Study materials	0-5, written examination 100%. Satisfactorily completed assignment required. Pyrhönen, Jokinen, Hrabovcova: Design of Rotating Electrical Machines (Pyörivän sähkökoneen suunnittelu).
Prerequisites	Students are recommended to have completed Electric Circuits, Basics of Electric Engineering, and Laboratory Course in Electrical Engineering and attended the lectures of Electromagnetism.

BL30A060	POWER ELECTRONICS	6 ECTS cr
	Power Electronics	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Lasse Laurila	
Aims	The course provides the student with a good general knowledge of the different basic circuits in modern power electronics. The course acquaints students with the features and functions of different switch-mode converters and inverters. In addition, the course will offer an insight into the joint operation of static converters and load as well as the network interferences caused by converters and possibilities for reducing these interferences.	
Content	Operation of the main circuits of different power converters: rectifiers (single and three-phase), DC-DC switch mode converters and power supplies (buck, boost, buck-boost, Cúk, flyback, forward), inverters (single and three-phase), resonance converters (ZVS, ZCS). Characteristics and operation. Pulse width modulation (PWM). Harmonic components. Simulation of power electronic circuits. This course is also suitable for postgraduate students.	
Modes of Study	14 h of lectures, 14 h of tutorials, 1st period	
Evaluation	14 h of lectures, 14 h of tutorials, 2nd period. Written examination	
Study materials	0 - 5, written examination 100%	
Prerequisites	Mohan, Undeland, Robbins: Power Electronics, converters, applications, and design, where applicable. Electric Circuits. Integration and derivation (esp. sine and cosine functions). FFT. Laplace transforms.	

BL30A1010	SEMINAR COURSE IN ELECTRICAL DRIVES	4 ECTS cr
	Seminar Course in Electrical Drives	
	The course is designed for students of the Master's degree program in electrical engineering and for students and postgraduate students interested in the fundamental principles of electrical drives. It is an intensive overview of BL30A1000 Sähkökäytöt and will be lectured only if required.	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Juha Pyrhönen	
Aims	The course addresses the theory and operation of electrical motor drives. In particular, the course focuses on the operation of modern AC drives. The course is intended for persons working on controlled electrical drives. After having successfully passed the course a student should have good basic knowledge for working in the field of electric drives.	
Content	Theory, operation and vector equivalent circuits of electrical motor drives. Fundamentals of space vector theory. Synchronous machine drives. Asynchronous motor drive. DC drive. Torque production mechanisms in different machines. Power electronic converter main topologies for motor control. Modulation principles. Scalar control, vector control, direct flux linkage control and direct torque control (DTC).	

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Modes of Study	Intensive course. 3 sessions of 6 h lectures, 1 session of 6 h seminar, 1 session of 6 h tutorials, 1st period. Seminar work, simulation task.
Evaluation	0 - 5, seminar work 50 % and written examination 50%.
Prerequisites	The students are recommended to have completed the courses Electric Circuits, Basics of Electric Engineering, and Laboratory Course in Electrical Engineering, and to have attended the courses Design of an Electrical Machine and Power Electronic Components; Introduction to Electrical Drives, Electromagnetic Components.

BL30A1200	NUMERICAL METHODS IN ELECTROMAGNETISM	4 ECTS cr
	Numerical Methods in Electromagnetism	
Year and Period	M.Sc. (Tech.) 2, Period 3	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Janne Nerg	
Aims	This course trains the student to use commercial calculation software and to select the best solution for the specific purpose.	
Content	The fundamentals of the element method, boundary conditions, the modelling of materials, the post-processing of results. Iron loss models. Eddy current problems, utilisation of circuit model in calculation. This course is also suitable for postgraduate students.	
Modes of Study	28 h of supervised tutorials. 3rd period. Course requirements: participation in tutorials and a satisfactorily completed assignment.	
Evaluation	0 - 5, assignment 100%	
Prerequisites	Introduction to Electrical Drives and Design of an Electrical Machine	

BL40A1000	REAL-TIME OPERATING SYSTEMS AND PROGRAMS	5 ECTS cr
	Real-time Operating Systems and Programs	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Julius Luukko	
Aims	The course provides the student with skills needed for constructing an application program of an embedded system by using real-time operating system as the architecture. The student is trained to utilise the services of a real-time operating system.	
Content	Basic concepts of a real-time system. Services provided by a real-time operating system: task management, time management, semaphores, mutual exclusion semaphores (mutex), event flags, mailboxes, message queues, and memory management. Implementation of a real-time operating system: context switch, interrupt management. Processor-specific parts of a real-time operating system and adapting the real-time operating system to a new processor.	
Modes of Study	21 h of lectures, 14 h of tutorials, 1st period. 21 h of lectures, 14 h of tutorials, 2nd period. Written examination.	
Evaluation	0 - 5, examination 100%. Satisfactorily completed assignment required.	
Study materials	Labrosse, J.J.: MicroC/OS-II The Real-Time Kernel (2nd Edition).	
Prerequisites	Embedded System Programming.	

BL40A1100	EMBEDDED SYSTEM PROGRAMMING	4 ECTS cr
	Embedded System Programming	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Tuomo Lindh	
Aims	The course provides the student with skills to apply C language and its structures in embedded system programming.	
Content	Embedded system programming, design tools, C language in embedded	

Modes of Study	system programming, the utilisation of microcontroller environment (registers, timers, buses, A/D conversion etc.). Typical data structures, typical program structures in real-time applications. Programming the Windows interface, basic properties of real-time operating systems. 14 h of lectures, 14 h of tutorials, 1st period.
Evaluation	14 h of lectures, 14 h of tutorials, 2nd period. Assignment. Written examination. 0 - 5, examination 100%. Satisfactorily completed assignment required.
Study materials	Wolf, W.: Computers as components: principles of embedded computing system design. Lecture notes.
Prerequisites	Basics of C language.

BL40A1200	DIGITAL CONTROL DESIGN	4 ECTS cr
	Digital Control Design	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Postdoctoral Researcher, D.Sc. (Tech.) Rafal Jastrzebski	
Aims	The course provides the student with skills to design and implement digital control algorithms in a discrete time domain. The focus lays mainly on discrete time state-space design methodology.	
Content	State feedback, state estimator, design of a state-space controller, polynomial control design. Fundamentals of multivariable control system. Simulation of digital control system with Simulink. Programming of digital control for a microprocessor. Design examples. Utilisation of MATLAB in control design. Examples of control solutions in industrial electronics.	
Modes of Study	14 h of lectures, 14 h of tutorials, 1st period. 6-10 h of demonstration lectures and laboratory demonstrations, 14 h of tutorials in computer class, 2nd period. Assignment. Written examination.	
Evaluation	0 - 5, examination 100%. Satisfactorily completed assignment required.	
Prerequisites	BL40A0200 Control Systems Introduction and BL40A0501 Digital Control an Introduction.	

BL40A1810	MICROPROCESSORS A	6 ECTS cr
	Mikroprosessorit A	
Year and Period	B.Sc. (Tech.) 3, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Jero Ahola	
Aims	The course acquaints the students with the functioning and use of microprocessor components. The course gives the students the skills to program and design embedded microcomputer systems.	
Content	The architecture, instruction set and functioning of a microprocessor. Microcontrollers. The structure and design of memory circuits and peripheral components. System design. Programming and application development. Application examples. An introduction to signal processors.	
Modes of Study	3rd period: 14 h of lectures, 14 h of tutorials. 4th period: 14 h of lectures, 14 h of tutorials. Assignment. Written examination.	
Evaluation	0 - 5, exam 100%. Satisfactorily completed assignment required.	
Study materials	Vahid/Givargis, Embedded System Design - A Unified Hardware/Software Introduction. Lecture notes.	
Prerequisites	Basic Digital Circuits and Basic Electronics A + B, Fundamentals of Programming.	

BL40A2201	PROCESS AND PRODUCT INNOVATIONS	10 ECTS cr
	Process and Product Innovations	
	Mainly for Finnish and international students from the departments of Chemical Technology, Mechanical Engineering, Electrical Engineering	

	and Industrial Engineering and Management. The number of participants is limited and the applicants will be interviewed.
Year and Period	M.Sc. (Tech.) 1-2, Period 1-4
Teacher(s)	Professor, D.Sc. (Tech.) Riku Pöllänen, Professor, D.Sc. (Tech.) Tuomo Kässi, Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen, Senior Lecturer, D.Sc. (Tech.) Ville Ojanen
Aims	Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen To get acquainted with the generation of innovations and new technology, the typical methods, problems and their solutions. To train project and teamwork in interdisciplinary, international environment. To get acquainted with product and process development. To train and deepen many skills learned in other connections.
Content	Methods of product and process development. Interdisciplinary R & D activities as project and teamwork. Development of new technology, patenting. Suitable also for postgraduate studies.
Modes of Study	Informational lectures, 6 h/period. Project meetings, 6 h/period.
Evaluation	Independent project and teamwork in groups of 4-8 students. 0-5, project work 100 %.

BL50A0600	ELECTROMAGNETIC COMPATIBILITY IN POWER ELECTRONICS	2 ECTS cr
	Electromagnetic compatibility in power electronics	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Pertti Silventoinen	
Aims	This course provides the student with skills to understand the occurrence mechanisms of interferences in power electronics, the effects of cable reflection, and the occurrence mechanisms and prevention of network harmonics. The course can also be included in post-graduate studies.	
Content	Power electronics as an interference source, network harmonics, reflection phenomena of cables, conductive RF interference, interference radiation of power electronics, filtering techniques of conductive interferences.	
Modes of Study	14 h of lectures, 1st period.	
Evaluation	An assignment to be completed as pair work. Written examination. 0 - 5, written examination 100%. Satisfactorily completed assignment required.	

BL50A1300	ADVANCED COURSE IN ELECTRONICS	6 ECTS cr
	Advanced Course in Electronics	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Pertti Silventoinen	
Aims	During this course, the student will obtain a deep knowledge of a new topic in electronics. Suitable also for postgraduate studies.	
Content	The course contents are subject related and will be specified during the introductory lectures.	
Modes of Study	2h of introductory lectures 2 h, 12 h of seminar presentations, 3rd period. 14 h of seminar presentations, 4th period. No written examination.	
Evaluation	0 - 5, seminar presentation 100%.	

4.4. Master's Degree Programme in Mechanical Engineering

The Master's degree programme in Mechanical Engineering corresponds to 120 ECTS credits and leads to the degree of Master of Science in Technology. The students have two years of full-time studies in which all lectures and laboratory work are conducted in English. The first three semesters include 90 ECTS credits of classroom and laboratory instruction. The Master's thesis of 30 ECTS credits is conducted in the fourth semester, after other courses have been completed.

The Aims of the Master's Degree Programme

Particular emphasis is placed on future product design and production technologies. The programme aims to provide in-depth knowledge in design- or production related areas such as machine design, steel structures, welding technology, laser technology as well as production and sheet metal technology. It is aimed at students who wish to pursue a career in mechanical engineering industry using advanced engineering techniques.

Careers for Graduates

The programme provides the foundation for both constructive design as well as production-oriented tasks. The professional tasks may include, for example, product development and design, management of design and production projects, technical sales. The professional scope often includes educational, research and marketing tasks as well as specialist responsibilities in technical inspection and project management. The programme also provides the students with knowledge and skills for scientific doctoral studies in the field of mechanical engineering.

The Degree Structure of the Programme

Degree Structure		
General Studies	7-9	ECTS cr
Major Subject	30 (min.)	ECTS cr
Minor Subject	20 (min.)	ECTS cr
Elective Studies	31-33 (min.)	ECTS cr
Master's Thesis and Seminar	30	ECTS cr
<i>Total</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

General Studies (7-9 ECTS cr):

General studies are common to all the students in the programme. The studies provide a brief introduction to the field of mechanical engineering as well as language skills essential for M.Sc. studies.

Major Subject Mechanical Engineering (min 60 ECTS cr):

The person responsible for major in Mechanical Engineering is professor, D.Sc. (Tech.) Aki Mikkola
In the mechanical engineering programme, students focus on machine design and manufacturing aspects. In the machine design studies, students learn both the theory and practice of developing mechanical engineering systems for performance, strength and durability. They learn to use state-of-the-art computer tools for creating and testing virtual prototypes in such that complex mechatronic systems and structures can be designed, tested and optimized before a prototype is fabricated. In the manufacturing studies, students learn about modern production systems and production planning. Special emphasis is given to welding technology, laser processes (welding, cutting and heat treatment), high technology machining operations and sheet metal and plate forming. In addition, studies on new metallic and non-metallic materials are included in the programme.

The person responsible for major in Mechanical Engineering is professor Aki Mikkola (Machine design). Other professors for major studies in the programme are professor Jukka Martikainen (Welding technology), professor Veli Kujanpää or professor Antti Salminen (Laser processes) and professor Juha Varis (Production technology).

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Minor Subject (min. 20 ECTS cr):

Students can choose any minor subject taught at LUT if the required prerequisites are completed.

Elective Studies (min. 10 ECTS cr):

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise.

General Studies 7-9 ECTS cr

<i>General Studies</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0300 Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3 M.Sc. (Tech.) 1-2	1, 2, 3, 4	2
	B.Sc. (Econ. & Bus. Adm.) 2-3 M.Sc. (Econ. & Bus. Adm.) 1-2		
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3 M.Sc. (Tech.) 1-2	1-2, 3-4	4
	B.Sc. (Econ. & Bus. Adm.) 3 M.Sc. (Econ. & Bus. Adm.) 1-2		
FV18A9101 [†] Finnish 1		1, 3	2

[†] Foreign students are required to study at least one course of Finnish language

Major in Mechanical Engineering

<i>Elective Studies (min 10 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0100 Individual Project Work	M.Sc. (Tech.) 1	1-4	6
BK20A0100 Materials Science	M.Sc. (Tech.) 1	1-2	6
BK20A0400 Modern Welding Technology	M.Sc. (Tech.) 1	1-2	7
BK30A0500 Laser Processing	M.Sc. (Tech.) 1	1-2	5
BK50A0700 Advanced Production Engineering	M.Sc. (Tech.) 1	1-2	7
BK60A0300 Servo Control Engineering	M.Sc. (Tech.) 1	1-2	6
BK70A0000 Simulation of a Mechatronic Machine	M.Sc. (Tech.) 1	3-4	6
BK80A1200 FE-analysis course	M.Sc. (Tech.) 1	3-4	5
Thesis [†] Master's Thesis and Seminar			30

[†] Obligatory for all

Minor in Packaging Technology

<i>Obligatory Studies (20 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK20A1300 Packaging Materials	M.Sc. (Tech.) 1	1-2	4
BK20A1500 Principles of Chemistry, Paper Technology and Food Technology	M.Sc. (Tech.) 1	1-4	5
BK50A1201 Machine Design for Packaging Technology	M.Sc. (Tech.) 1	2-3	4
BK50A1401 Packaging Lines and Machinery	M.Sc. (Tech.) 2	3-4	7

Additional Information

Personal Study Plans

At the beginning of their studies, students prepare a personal study plan, in which the student and the contact persons of the degree programme agree on what studies the student will pursue and in what order. This plan includes detailed information on the major subject, minor subject, general studies, elective studies, credit transfer from previous degree/studies and possible complementary studies.

Credit Transfers

ECTS credits can be transferred from the student's previous university level studies or higher university degrees from Finnish or foreign universities. More information on credit transfer is available from Study Coordinator.

Complementary Studies (20-60 ECTS cr)

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree. The course FV13A1200 Teknisk svenska 2 ECTS cr is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.

Further Information

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The Courses Offered in English

		<i>ECTS cr</i>
BK10A0100	Individual Project Work	6
BK10A0300	Introduction to M.Sc. Studies	1
BK20A0100	Materials Science	6
BK20A0400	Modern Welding Technology	7
BK20A1300	Packaging Materials	4
BK20A1500	Principles of Chemistry, Paper Technology and Food Technology	5
BK30A0500	Laser Processing	5
BK50A0700	Advanced Production Engineering	7
BK50A1201	Machine Design for Packaging Technology	4
BK50A1401	Packaging Lines and Machinery	7
BK60A0300	Servo Control Engineering	6
BK60A0601	Process and Product Innovations	10
BK70A0000	Simulation of a Mechatronic Machine	6
BK80A1200	FE-analysis course	5
BK80A1401	Fatigue Design	6

<i>BK10A0100</i>	<i>INDIVIDUAL PROJECT WORK</i>	<i>6 ECTS cr</i>
	Individual Project Work	
	Only for the students of Master's Degree Programmes in Mechanical Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professors of the Degree Programme of Mechanical Engineering	
Content	The student will apply methods of engineering and/or research work to a design or production technology related project supervised by a professor, industrial representative or researcher/instructor. The work will be reported and presented.	
Modes of Study	10 h of lectures, 1st-4th period. 150 h of tutorials and independent projects, 1st-4th period.	
Evaluation	Pass/Fail, based on written report and oral presentation.	
Prerequisites	Consent of supervising professor.	

<i>BK10A0300</i>	<i>INTRODUCTION TO M.SC. STUDIES</i>	<i>1 ECTS cr</i>
	Introduction to M.Sc. Studies	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	N. N. Information Specialist, M.Sc. (Tech.) Marja Talikka Study Coordinator, M.A. Minna Loikkanen	
Content	This course will help orient international students to the basics of study at LUT. Orientation week activities, information gathering, and essay.	
Modes of Study	Lectures 8 h, 1st period. Exercises 10 h Independent work 8 h	
Evaluation	Pass/Fail, grade based on participation, exercises and essay.	
Study materials	LUT Web.	

BK20A0100	MATERIALS SCIENCE	6 ECTS cr
	Materials Science	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Senior Assistant, Lic.Sc. (Tech.) Raimo Suoranta	
Aims	The student is capable to select proper material according to functionality and economically.	
Content	The structure of steel, plastic deformation, restoration, hardening, heat treatment methods. Selecting materials according to strength, toughness, corrosion resistance, wear resistance. Manufacturability. Light metals and non-metallic materials.	
Modes of Study	LCC. Systems for selecting materials. 28 h of lectures, 1st-2nd period. 42 h of independent work, 1st-2nd period.	
Evaluation	0-5, examination 75%, tutorials 25%.	
BK20A0400	MODERN WELDING TECHNOLOGY	7 ECTS cr
	Modern Welding Technology	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Senior Assistant, Lic.Sc. (Tech.) Raimo Suoranta M.Sc. (Tech.) Paul Kah	
Aims	Understanding the special features welding in production and product design. Be able to choose proper process and welding procedure for different materials.	
Content	Productivity, economy and quality in welding. Welding costs. Productive and efficient new welding processes. Weldability of materials. Mechanization and robotization of welding. Mechanization and robotization equipment and systems. The design of welded structures. Methods for preparing roots. The quality, environmental and safety in welding workshop.	
Modes of Study	Lectures 28 h, 1st-2nd period. Tutorials 14 h, seminar, 1st-2nd period. Exam.	
Evaluation	0-5, examination 80%, seminar 20%.	
Study materials	Lecture notes.	
BK20A1300	PACKAGING MATERIALS	4 ECTS cr
	Packaging Materials	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Henry Lindell	
Aims	To provide understanding of the packaging related properties of various packaging materials.	
Content	The manufacture, physical and chemical properties (relevant for packaging) of the major packaging materials: paper, paperboard, corrugated board, wood, glass, metals, polymers including biopolymers and adhesives. Foreseeable future development of each material. Material composite possibilities and their use. Capability to select material alternatives or combinations for specific packaging solutions based on their possible performance characteristics.	
Modes of Study	Lectures total 16 h, 1st-2nd period. Exercises total 7 h, 1st-2nd period.	
Evaluation	0-5, examination 70%, exercises 30%.	
Study materials	Course material. Handouts.	

BK20A1500	PRINCIPLES OF CHEMISTRY, PAPER TECHNOLOGY AND FOOD TECHNOLOGY	5 ECTS cr
	Principles of Chemistry, Paper Technology and Food Technology	
	Belongs only to complementary studies of New Packaging Solutions and minor subject in Packaging Technology. Course registrations during 1st period.	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professor, Ph.D. Henry Lindell	
Aims	Understanding basic general, organic and biochemical phenomena. Understanding basics of paper technology and products. Understanding packaging related features of processed food.	
Content	Basic phenomena of general, organic and biochemistry. Main fibre grades and other raw materials and their role in paper products, the main part processes of paper production, typical properties of the main paper and board grades. The basic principles of foods and processing theory, the main food processes and their effect on foods considering packaging.	
Modes of Study	Essays with specific instruction.	
Evaluation	Pass/Fail.	
Study materials	Smook G.A., Handbook for Pulp & Paper Technologists, 2nd edition, p 1-7, 36-44, 194-324 or Smook G.A., Handbook for Pulp & Paper Technologists, 3rd edition, p 1-9, 37-45, 190-324 or Herbert Holik, Handbook of Paper and Board, Wiley-VCH Verlag GmbH & Co. KgaA, Wennheim, Germany. Bettelheim & March, Introduction to General, Organic and Biochemistry Saunders College Publishing Fellows P., Food processing technology - Principles and Practice, 2nd edition, Part I p 7-62, III and IV, p 229-452.	
BK30A0500	LASER PROCESSING	5 ECTS cr
	Laser Processing	
	Replaces the courses BK30A0100 Laser Processes and BK30A0200 Product Design for Laser Processing.	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Antti Salminen	
Aims	Understanding laser processing and the special features of it in production and product design.	
Content	Lasers, laser systems and processes of laser materials processing. The interaction between laser beam and material, absorption and the use of this in laser materials processing like welding, cutting, hardening, cladding, drilling and marking. The formation of keyhole and its importance on laser welding. Application of laser welding, cutting and surface treatments on practical cases. Laser processing optics, occupational safety and quality assurance. Readiness to utilize the possibilities offered by various laser processes in product design and productivity of production.	
Modes of Study	Lectures 28 h, 1st-2nd period. Tutorials 14 h, 1st-2nd period. Exam.	
Evaluation	0-5, exam 80%, seminar 20%.	
Study materials	Steen W., Laser Material Processing.	

BK50A0700	ADVANCED PRODUCTION ENGINEERING	7 ECTS cr
	Advanced Production Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Juha Varis Researcher/Teacher, Lic.Sc. (Tech.) Inga Sihvo	
Aims	This course will deepen the student's knowledge of the most advanced design and production methods, equipment, equipment systems and modern product facilities used especially in the manufacture of thin and rough sheet metal products. The student will also learn to understand the role of manufacturing as a part of the company's strategy and to design and use production systems. The course will provide the student with the ability to handle duties in factory management and development as well as in research in the field.	
Content	The manufacturing methods for modern metal cutting and sheet metal production. The advanced production methods for punching, folding and mechanical joining of sheet metal products. The production control systems of flexible automatic (FMS, IMS) production factories. The significance and technologies of product design as well as of production (CAD, CAP, PPS, CAM) especially in the manufacture of thin and rough sheet metal production. DFMA and costs functions of products, production controlling and simulation. The operation of a factory as part of a principal-supplier network. The technology and methods for improving production. The material handling, production and information systems of a workshop.	
Modes of Study	The development of the operations of a workshop and quality technology. Lectures 2 h, 1st period. Instructions will be given at start-up lecture. Self study material, exercises and an exam.	
Evaluation	0-5, examination 100%, exercises pass/fail.	
Study materials	Materials to be announced during the start-up lecture.	
BK50A1201	MACHINE DESIGN FOR PACKAGING TECHNOLOGY	4 ECTS cr
	Machine Design for Packaging Technology	
	Replaces the course BK50A1200 Machine Design for Packaging Technology.	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Harri Eskelinen	
Aims	To provide understanding of most important mechanisms and their machine parts for packaging solutions by utilizing the basic theories of DFM(A).	
Content	Basic mechanisms types, mechanisms analysis and synthesis, reliability-based machine design, wear and lifetime analysis of selected machine parts and elements. Different methodologies of DFM(A) and means to apply them in packaging technology. Knowledge about how to design a simple machine or mechanisms for packaging operations and means to estimate functional aspects of applied technology.	
Modes of Study	Lectures total 14 h, 2nd-3rd period. Exercises total 26 h, 2nd-3rd period. Seminar 28 h, 2nd-3rd period.	
Evaluation	0-5, examination 70%, exercises and seminar 30%	
Study materials	Erdman A.G., Mechanism Design. Norton R.L., Design of Machinery.	

BK50A1401	PACKAGING LINES AND MACHINERY	7 ECTS cr
	Packaging Lines and Machinery	
	Replaces the course BK50A1400 Packaging Lines and Machinery.	
Year and Period	M.Sc. (Tech.) 2, Period 3-4	
Teacher(s)	Professor, Ph.D. Henry Lindell Researcher, D.Sc. (Tech.) Jari Varis Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen Researcher, M.Sc. (Tech.) Ville Leminen Visiting lecturer, M.Sc. (Tech.) Jari Saari	
Aims	To provide understanding for operations and functions of packaging lines and their development aspects.	
Content	The unit processes in packaging line, the main components of packaging line. The main filling technologies in food packaging, for example liquid packaging, aseptic packaging, MAP packaging, autoclave packaging. The main filling technologies in non-food packaging like pharma, electronics, industrial packaging. Technologies used in carton packaging and flexible packaging: pouch, wrapping, form-fill-seal. The focus in fibre based packaging. Instrumentation, automation, robotics in packaging lines.	
Modes of Study	Lectures 20 h, group work and seminars 30 h.	
Evaluation	0-5, seminar 100%.	
Study materials	Handouts provided on Blackboard.	
BK60A0300	SERVO CONTROL ENGINEERING	6 ECTS cr
	Servo Control Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Heikki Handroos	
Content	Control of hydraulic, pneumatic, and electrical servodrives. Structures and properties of basic types of servo-drives. Selection of appropriate control methods for different drive types. Fuzzy control of servodrives. Ability to design and control of different types of servodrives. Ability to evaluate the achievable properties of different servodrives. Suitable also for postgraduate studies.	
Modes of Study	42 h of lectures, 1st-2nd period. 42 h of tutorials, 1st-2nd period. 30 h of exercises, 2nd period.	
Evaluation	0-5, examination 100%.	
Study materials	Lecture notes.	
Prerequisites	The student must have completed BK60A0001 Mekatroniikan peruskurssi. Recommended BK60A0100 Hydrauliteknikka (not required from students of Master's Degree Programmes in Mechanical Engineering).	
BK60A0601	PROCESS AND PRODUCT INNOVATIONS	10 ECTS cr
	Process and Product Innovations	
	Mainly for Finnish and international students from the departments of Chemical Technology, Mechanical Engineering, Electrical Engineering and Industrial Engineering and Management. The number of participants is limited and the applicants will be interviewed.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-4	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen Professor, D.Sc. (Tech.) Tuomo Kassi	

Aims	Senior Lecturer, D.Sc. (Tech.) Ville Ojanen Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen To get acquainted with the generation of innovations and new technology, the typical methods, problems and their solutions. To train project and teamwork in interdisciplinary, international environment. To get acquainted with product and process development. To train and deepen many skills learned in other connections.
Content	Methods of product and process development. Interdisciplinary R & D activities as project and teamwork. Development of new technology, patenting.
Modes of Study	Informational lectures, 6 h/period. Project meetings, 6 h/period.
Evaluation	Independent project and teamwork in groups of 4-8 students. 0-5, project work 100%.

BK70A0000	<i>SIMULATION OF A MECHATRONIC MACHINE 6 ECTS cr</i>
	Simulation of a Mechatronic Machine
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Teacher(s)	Professor, D.Sc. (Tech.) Aki Mikkola
Aims	The student will obtain the theoretical ability for the mathematical modelling and computer simulation of machine systems that are hydraulically, pneumatically or electronically actuated. The student will also obtain knowledge to utilize static, kinematic and dynamic analysis in a machine design process.
Content	Principles of multibody dynamics, modelling of actuators, coupled simulation. Description of mechanic flexibility. The use of Lagrangian equation. Constraint equations and Lagrangian multipliers. Inertia of rigid bodies. Modeling of hydraulic components. Numerical integration of the equation of motion. Rotation matrix in spatial cases.
Modes of Study	28 h of lectures, 3rd-4th period. 28 h of supervised tutorials, 3rd-4th period.
Evaluation	0-5, examination or mid-course examinations 90%, simulation work 10%.
Study materials	Lecture notes.
Prerequisites	Students are recommended to have completed BK60A0001 Mekatroniikan peruskurssi, BK80A0000 Statiikka, BK80A0100 Dynamiikka I BK80A2500 Dynamiikka II (not required from students of Master's Degree Programmes in Mechanical Engineering).

BK80A1200	<i>FE-ANALYSIS COURSE 5 ECTS cr</i>
	FE-analysis course
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Pasi Tanskanen
Aims	The aim of this course is to ensure that the student has a good knowledge of the theoretic fundamentals of FE analysis as well as a basis for the reliable use of FEM software.
Content	The student will be acquainted with the procedure of static linear-elastic FE analysis with the aim of providing the student with a basic knowledge of the derivation of element stiffness matrices of elements, the assembly of a global stiffness matrix, the handling of boundary conditions and loading as well as the problem solving. In the tutorials the student will be acquainted with FE modelling using commercial software.
Modes of Study	28 h of lectures, 3rd-4th period. 28 h of tutorials, 3rd-4th period.
Evaluation	0-5, examination 50%, exercises 50%.
Study materials	The material is to be specified during lectures.

BK80A1401	FATIGUE DESIGN	6 ECTS cr
	Väsymiskestävyys	
	Replaces the course BK80A1400 Fatigue Design. The course will be lectured in Finnish. The foreign students read the course book (the particular chapters), carry out the home exercises and finally participate the exam in order to pass the course.	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Timo Nykänen Professor, D.Sc. (Tech.) Timo Björk	
Content	Principals of design to avoid fatigue failure of mechanical engineering components and structures. Introduction to fatigue, dynamic loading of structures, deformation of structural materials, stress concentrations, introduction to fracture mechanics. Design of structures based on stress-life approach, strain life approach and linear elastic fracture mechanics.	
Modes of Study	42 h of lectures, 1st-2nd period. 40 h of tutorials, 1st-2nd period.	
Evaluation	0-5, examination 60%, home exercises 40%.	
Study materials	Material prepared for the course in Blackboard. Dowling N.E., Mechanical Behavior of Materials 2nd ed., Prentice Hall.	
Prerequisites	BK80A0501 Lujuusoppi II or BK20A0100 Materials Science.	

4.5. Master's Degree Programme "New Packaging Solutions"

The Master's degree programme "New Packaging Solutions" is a part-time programme leading to the degree of Master of Science in Technology. Teaching is organized as intensive teaching periods (4-5 days at a time) during the academic year, and distance learning solutions are widely used. Students have two years (90 ECTS credits) of coursework in which all lectures, exercises and laboratory work are conducted in English. The Master's thesis (30 ECTS credits) will be conducted after the other courses have been completed.

The Aims of the Master's Degree Programme

The objective of the programme is to educate experts in packaging materials, converting and packaging technologies who possess the skills to work throughout the whole packaging chain. It is aimed at students already working in packaging related businesses or wishing to pursue a career in the industry dealing with packaging.

Careers for Graduates

The packaging field offers a great diversity of employment opportunities in production, research, development and sales & marketing. The professional tasks may include, for example, production, product development and design, marketing and sales in domestic and international businesses.

The Degree Structure of the Programme

Degree Structure		
General Studies	18	ECTS cr
Major Subject	42	ECTS cr
Minor Subject	20	ECTS cr
Elective Studies	10 (min.)	ECTS cr
Master's Thesis and Seminar	30	ECTS cr
<i>Total</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

General Studies (18 ECTS cr):

General studies are common to all the students in the programme. The studies provide a brief introduction to the packaging field and packaging materials as well as language & communication skills essential for M.Sc. studies.

Major Subject (42 ECTS cr):

The person responsible for major subject in Packaging Technologies is professor, Ph.D. Henry Lindell.

The main focus of the major subject is on paper and paperboard converting technologies, packaging machinery and packaging technologies, planning and design of packaging solutions and understanding of packaging chain demands.

Master's Thesis and Seminar (30 ECTS cr):

The Master's thesis is a research or design project, which will be written after the other courses have been completed. It is carried out in the field of the student's major subject.

Minor Subject (20 ECTS cr):

Choices of other minor subjects will be treated on a case-by-case basis. The recommended minor subject is Industrial Management.

Elective Studies (min. 10 ECTS cr):

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise. Foreign students are recommended to study one or more courses of Finnish language.

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General Studies

<i>General Studies (18 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
BK10A0800	Introduction to M.Sc. Studies in Packaging	M.Sc. (Tech.) 1	1	1
BK20A1300	Packaging Materials	M.Sc. (Tech.) 1	1-2	4
FV10A 12EC ^c	Language and Communication Studies			12

^c) The following studies of English language are recommended:

<i>Language and Communication Studies (12 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
FV11A4200	Writing for Business	1, 3, 4	2
FV11A6201	English for Meetings and Discussions	3-4	3
FV11A9300	Scientific and Technical English Writing Course		4
FV11A9750	Aspects of Culture		3

Major Subject in Packaging Technologies

<i>Obligatory Studies (72 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0100	Individual Project Work	M.Sc. (Tech.) 1	1-4	6
BK20A1201	Interaction of the Package and the Content, Passive and Active Packaging	M.Sc. (Tech.) 1	3-4	4
BK20A1400	Coating and Lamination of Fibre Based Packaging Materials	M.Sc. (Tech.) 1	1-3	5
BK50A1201	Machine Design for Packaging Technology	M.Sc. (Tech.) 1	2-3	4
BK50A1300	Converting and Forming of Fibre Based Packaging	M.Sc. (Tech.) 2	1-2	5
BK50A1401	Packaging Lines and Machinery	M.Sc. (Tech.) 2	3-4	7
BK50A1500	Printing and Varnishing	M.Sc. (Tech.) 1	2-3	2
BK50A1601	Functions of Package, Packaging Formats and Package Design	M.Sc. (Tech.) 2	1-2	5
BK50A1701	Food Packaging Hygiene, Legislation on Packaging, Sustainability and Environmental Issues Related to Packaging	M.Sc. (Tech.) 2	1-3	4
Thesis	Master's Thesis and Seminar			30

Additional Information

Minor Subject in Industrial Management

Industrial Management 20 ECTS credits (**only for the Master's degree programme NPS**)

<i>Alternative studies</i>		<i>per.</i>	<i>ECTS cr</i>
CS10A0051	Introduction to International Business for NPS-programme	4	5
CS30A1500	Transportation Systems	4 int.	5
CS30A7100	Management of Technology	1-2	5
CS34A0400	Strategic Entrepreneurship in Age of Uncertainty	1	5
CS34A0500	Technology Commercialization and Corporate Venturing	4 int.	5

Personal Study Plans

At the beginning of their studies, students prepare a personal study plan, in which the student and the contact persons of the degree programme agree on what studies the student will pursue and in what order. This plan includes detailed information on the major subject, minor subject, general studies, elective studies, credit transfer from previous degree/studies and possible complementary studies.

Credit Transfers

ECTS credits can be transferred from the student's previous university level studies or higher university degrees from Finnish or foreign universities. More information on credit transfer is available from Study Coordinator.

Complementary Studies (20-60 ECTS cr)

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree. The course FV13A1200 Teknisk svenska 2 ECTS cr is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.

Further Information

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Courses offered in English

		<i>ECTS cr</i>
BK10A0100	Individual Project Work	6
BK10A0300	Introduction to M.Sc. Studies	1
BK10A0800	Introduction to M.Sc. Studies in Packaging	1
BK20A1201	Interaction of the Package and the Content, Passive and Active Packaging	4
BK20A1300	Packaging Materials	4
BK20A1400	Coating and Lamination of Fibre Based Packaging Materials	5
BK20A1500	Principles of Chemistry, Paper Technology and Food Technology	5
BK50A1201	Machine Design for Packaging Technology	4
BK50A1300	Converting and Forming of Fibre Based Packaging	5
BK50A1401	Packaging Lines and Machinery	7
BK50A1500	Printing and Varnishing	2
BK50A1601	Functions of Package, Packaging Formats and Package Design	5
BK50A1701	Food Packaging Hygiene, Legislation on Packaging, Sustainability and Environmental Issues Related to Packaging	4
BK60A0601	Process and Product Innovations	10
CS10A0051	Introduction to International Business for NPS-programme	5
CS30A1500	Transportation Systems	5
CS34A0400	Strategic Entrepreneurship in Age of Uncertainty	5
CS34A0500	Technology Commercialization and Corporate Venturing	5

<i>BK10A0100</i>	<i>INDIVIDUAL PROJECT WORK</i>	<i>6 ECTS cr</i>
	Individual Project Work	
	Only for the students of Master's Degree Programmes in Mechanical Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professors of the Degree Programme of Mechanical Engineering	
Content	The student will apply methods of engineering and/or research work to a design or production technology related project supervised by a professor, industrial representative or researcher/instructor. The work will be reported and presented.	
Modes of Study	10 h of lectures, 1st-4th period. 150 h of tutorials and independent projects, 1st-4th period.	
Evaluation	Pass/Fail, based on written report and oral presentation.	
Prerequisites	Consent of supervising professor.	

<i>BK10A0300</i>	<i>INTRODUCTION TO M.SC. STUDIES</i>	<i>1 ECTS cr</i>
	Introduction to M.Sc. Studies	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	N. N. Information Specialist, M.Sc. (Tech.) Marja Talikka Study Coordinator, M.A. Minna Loikkanen	
Content	This course will help orient international students to the basics of study at LUT. Orientation week activities, information gathering, and essay.	
Modes of Study	Lectures 8 h, 1st period. Exercises 10 h Independent work 8 h	
Evaluation	Pass/Fail, grade based on participation, exercises and essay.	
Study materials	LUT Web.	

BK10A0800	INTRODUCTION TO M.SC. STUDIES IN PACKAGING	1 ECTS cr
	Introduction to M.Sc. Studies in Packaging	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, Ph.D. Henry Lindell Study Coordinator, M.A. Minna Loikkanen	
Aims	To provide understanding of packaging branch and the degree programme.	
Content	The course will introduce the packaging branch and packaging businesses and the main features of the degree programme. Students will make personal study plans.	
Modes of Study	8 h lectures, 1st period. 10 h exercises, 1st period. 8 h independent work, 1st period.	
Evaluation	Pass/Fail	
Study materials	Orientation days, Study guide Handouts.	
BK20A1201	INTERACTION OF THE PACKAGE AND THE CONTENT, PASSIVE AND ACTIVE PACKAGING	4 ECTS cr
	Interaction of the Package and the Content, Passive and Active Packaging	
	Replaces the course BK20A1200 Interaction of the Package and the Content.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, Ph.D. Henry Lindell	
Aims	Understanding of the main mechanisms about the interaction of package and the content especially in food packaging.	
Content	Microbiology and toxicology relevant to packaging materials, packages, machinery and the packed products. Fundamentals of the interaction of the packaging and the content. The main analyzing methods of packages and packaging materials. Aspects of passive and active packaging.	
Modes of Study	Lectures total 24 h, 3rd-4th period. Exercises total 12 h, 3rd-4th period.	
Evaluation	0-5, examination 80%, exercises 20%.	
Study materials	Handouts.	
BK20A1300	PACKAGING MATERIALS	4 ECTS cr
	Packaging Materials	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Henry Lindell	
Aims	To provide understanding of the packaging related properties of various packaging materials.	
Content	The manufacture, physical and chemical properties (relevant for packaging) of the major packaging materials: paper, paperboard, corrugated board, wood, glass, metals, polymers including biopolymers and adhesives. Foreseeable future development of each material. Material composite possibilities and their use. Capability to select material alternatives or combinations for specific packaging solutions based on their possible performance characteristics.	
Modes of Study	Lectures total 16 h, 1st-2nd period. Exercises total 7 h, 1st-2nd period.	

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Evaluation	0-5, examination 70%, exercises 30%.	
Study materials	Course material. Handouts.	
BK20A1400	COATING AND LAMINATION OF FIBRE BASED 5 ECTS cr PACKAGING MATERIALS	
	Coating and Lamination of Fibre Based Packaging Materials	
Year and Period	M.Sc. (Tech.) 1, Period 1-3	
Teacher(s)	Visiting lecturer, Professor, Jurkka Kuusipalo Professor, Ph.D. Henry Lindell	
Aims	To provide understanding of various ways to combine materials with paper and board and of their properties in packaging applications.	
Content	Raw materials, for main coating and laminating methods. Main properties (including printing) of the finished products. Focus in extrusion coating process. The main applications of paper based packaging materials in packaging sector. Combined packaging structures and their manufacturing techniques. Capability to run extrusion coating line and utilize fibre materials on the packaging solutions.	
Modes of Study	Lectures total 18 h, 1st-3rd period. Exercises total 8 h, 1st-3rd period. Seminar 1st-3rd period.	
Evaluation	0-5, examination 70%, exercises 30%.	
Study materials	Course material. Handouts. Lecturers' comments. Kuusipalo, J. ed., Paper and Paperboard Converting. In series of books: Papermaking Science and Technology, part 12, 2nd edition, Fapet, Helsinki.	
BK20A1500	PRINCIPLES OF CHEMISTRY, PAPER TECHNOLOGY AND FOOD TECHNOLOGY	5 ECTS cr
	Principles of Chemistry, Paper Technology and Food Technology	
	Belongs only to complementary studies of New Packaging Solutions and minor subject in Packaging Technology. Course registrations during 1st period.	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professor, Ph.D. Henry Lindell	
Aims	Understanding basic general, organic and biochemical phenomena. Understanding basics of paper technology and products. Understanding packaging related features of processed food.	
Content	Basic phenomena of general, organic and biochemistry. Main fibre grades and other raw materials and their role in paper products, the main part processes of paper production, typical properties of the main paper and board grades. The basic principles of foods and processing theory, the main food processes and their effect on foods considering packaging.	
Modes of Study	Essays with specific instruction.	
Evaluation	Pass/Fail.	
Study materials	Smook G.A., Handbook for Pulp & Paper Technologists, 2nd edition, p 1-7, 36-44, 194-324 or Smook G.A., Handbook for Pulp & Paper Technologists, 3rd edition, p 1-9, 37-45, 190-324 or Herbert Holik, Handbook of Paper and Board, Wiley-VCH Verlag GmbH & Co. KGaA, Wennheim, Germany. Bettelheim & March, Introduction to General, Organic and Biochemistry Saunders College Publishing Fellows P., Food processing technology - Principles and Practice, 2nd edition,	

BK50A1201	MACHINE DESIGN FOR PACKAGING TECHNOLOGY	4 ECTS cr
	Machine Design for Packaging Technology	
	Replaces the course BK50A1200 Machine Design for Packaging Technology.	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Harri Eskelinen	
Aims	To provide understanding of most important mechanisms and their machine parts for packaging solutions by utilizing the basic theories of DFM(A).	
Content	Basic mechanisms types, mechanisms analysis and synthesis, reliability-based machine design, wear and lifetime analysis of selected machine parts and elements. Different methodologies of DFM(A) and means to apply them in packaging technology. Knowledge about how to design a simple machine or mechanisms for packaging operations and means to estimate functional aspects of applied technology.	
Modes of Study	Lectures total 14 h, 2nd-3rd period. Exercises total 26 h, 2nd-3rd period. Seminar 28 h, 2nd-3rd period.	
Evaluation	0-5, examination 70%, exercises and seminar 30%	
Study materials	Erdman A.G., Mechanism Design. Norton R.L., Design of Machinery.	
BK50A1300	CONVERTING AND FORMING OF FIBRE BASED PACKAGING	5 ECTS cr
	Converting and Forming of Fibre Based Packaging	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, Ph.D. Henry Lindell Professor, D.Sc. (Tech.) Juha Varis Researcher, M.Sc. (Tech.) Panu Tanninen Laboratory Engineer, M.Sc. (Tech.) Jari Selesvuo N. N.	
Aims	To provide understanding of various paper and board converting technologies and their developments in package production.	
Content	The main technologies of carton forming: die cutting, scoring, folding of blanks and other forming technologies. Tool design (3D-systems) and tool manufacturing technologies in modern workshops. Machines and equipment for listed converting processes, and their integration into effective production systems. Sealing, gluing and closing technologies of fibre based packaging materials. The special requirements various paper based materials for converting processes. Features to be considered in multimaterial converting. Knowledge of the main paper package forming technologies. The requirements of various paper and board grades set for the processes.	
Modes of Study	Lectures, seminar work and an independent work.	
Evaluation	Written examination 100%.	
Study materials	Laboratory works; pass/fail. Lecture handouts.	

BK50A1401	PACKAGING LINES AND MACHINERY	7 ECTS cr
	Packaging Lines and Machinery	
	Replaces the course BK50A1400 Packaging Lines and Machinery.	
Year and Period	M.Sc. (Tech.) 2, Period 3-4	
Teacher(s)	Professor, Ph.D. Henry Lindell Researcher, D.Sc. (Tech.) Jari Varis Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen Researcher, M.Sc. (Tech.) Ville Leminen Visiting lecturer, M.Sc. (Tech.) Jari Saari	
Aims	To provide understanding for operations and functions of packaging lines and their development aspects.	
Content	The unit processes in packaging line, the main components of packaging line. The main filling technologies in food packaging, for example liquid packaging, aseptic packaging, MAP packaging, autoclave packaging. The main filling technologies in non-food packaging like pharma, electronics, industrial packaging. Technologies used in carton packaging and flexible packaging: pouch, wrapping, form-fill-seal. The focus in fibre based packaging. Instrumentation, automation, robotics in packaging lines.	
Modes of Study	Lectures 20 h, group work and seminars 30 h.	
Evaluation	0-5, seminar 100%.	
Study materials	Handouts provided on Blackboard.	
BK50A1500	PRINTING AND VARNISHING	2 ECTS cr
	Printing and Varnishing	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Teacher(s)	Visiting lecturer, M.Sc. (Tech.) Risto Vesanto	
Aims	To provide understanding of printing methods used in packaging industry. Capability to select a proper printing method for a certain packaging solution. Capability to solve printing problems and to control print quality.	
Content	Pre-press operations. The main printing technologies and their use in packaging industry. Printing of various substrates. Composition of printing inks. Print quality and defects. Print quality measurements. Emerging printing technologies and their potential use in packaging industry. Future trends of printing technologies.	
Modes of Study	Lectures total 12 h, 2nd-3rd period. Exercises total 6 h, 2nd-3rd period.	
Evaluation	0-5, examination 70%, exercises 30%.	
Study materials	Course material. Lecturers' comments. Saarelma, H., Oittinen P., Printing. In series of books: Papermaking Science and Technology, Book 13, Fapet, Helsinki 1999.	
BK50A1601	FUNCTIONS OF PACKAGE, PACKAGING FORMATS AND PACKAGE DESIGN	5 ECTS cr
	Functions of Package, Packaging Formats and Package Design	
	Replaces the course BK50A1600 Functions of Package and Packaging Formats.	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, Ph.D. Henry Lindell	
Aims	To provide understanding of various functions of packaging and packages and their future trends. To provide understanding of various formats of packages,	

Content	their merits and shortfalls in logistic chain and end-use. To provide understanding of challenges of packages in specific end uses. Aspects of the role of packaging throughout the value chain. The main categories packages and their use.
Modes of Study	Aspects for understanding of the main opportunities of various packaging formats in specific end uses when developing new solutions. Lectures 16 h.
Evaluation	Exercises/seminars 24 h. 0-5, seminar work.

BK50A1701	FOOD PACKAGING HYGIENE, LEGISLATION 4 ECTS cr ON PACKAGING, SUSTAINABILITY AND ENVIRONMENTAL ISSUES RELATED TO PACKAGING
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	Food Packaging Hygiene, Legislation on Packaging, Sustainability and Environmental Issues Related to Packaging
	Replaces the course BK50A1700 Legislation on Packaging and Environmental Issues Related to Packaging.
Year and Period	M.Sc. (Tech.) 2, Period 1-3
Teacher(s)	Professor, Ph.D. Henry Lindell M.Sc. Päivi Harju-Eloranta
Aims	To provide understanding of packaging hygiene, packaging related legislation and sustainability aspects and their impact on the packaging business.
Content	The main content of the EU legislation of food packaging hygiene, chemical and microbiological purity aspects in the packaging. Environmental issues of packaging and packaging waste and the relevant legislation. The environmental standardization of packages in EU. Sustainability aspects concerning packaging legislation on product safety aspects and traceability.
Modes of Study	Lectures total 16 h, 1st-3rd period. Exercises total 14 h, 1st-3rd period. Seminar 1st-3rd period.
Evaluation	0-5, examination 50%, seminar 50%.
Study materials	Handouts.

BK60A0601	PROCESS AND PRODUCT INNOVATIONS 10 ECTS cr
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	Process and Product Innovations
	Mainly for Finnish and international students from the departments of Chemical Technology, Mechanical Engineering, Electrical Engineering and Industrial Engineering and Management. The number of participants is limited and the applicants will be interviewed.
Year and Period	M.Sc. (Tech.) 1-2, Period 1-4
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen Professor, D.Sc. (Tech.) Tuomo Kässi Senior Lecturer, D.Sc. (Tech.) Ville Ojanen Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen
Aims	To get acquainted with the generation of innovations and new technology, the typical methods, problems and their solutions. To train project and teamwork in interdisciplinary, international environment. To get acquainted with product and process development. To train and deepen many skills learned in other connections.
Content	Methods of product and process development. Interdisciplinary R & D activities as project and teamwork. Development of new technology, patenting.
Modes of Study	Informational lectures, 6 h/period. Project meetings, 6 h/period.

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Evaluation	Independent project and teamwork in groups of 4-8 students. 0-5, project work 100%.	
CS10A0051	INTRODUCTION TO INTERNATIONAL BUSINESS FOR NPS-PROGRAMME	5 ECTS cr
	Introduction to International Business for NPS-programme, Johdatus kansainväliseen liiketoimintaan (NPS)	
	Only for the students of the Master´s degree programme "New Packaging Solutions".	
Year and Period	B.Sc. (Tech.) 2, Period 4	
Teacher(s)	Professor, Ph.D. Tauno Tiusanen	
Aims	Students have the basic knowledge of international business.	
Content	Must know: Basic definitions and features of international business will be introduced. Attention will be paid to foreign trade theories and alternatives in export business. Balance of payments on current account will be overviewed. Should know: Different trade policy alternatives are overviewed. Currency issues, especially exchange rates will be discussed. Evaluation of export markets and communicating across cultures.	
Modes of Study	Lectures 21 h 4. period.	
Evaluation	0-5, examination (80 %) and research report (20 %).	
Study materials	Lecture handouts. Root, Franklin: Entry Strategies: for International Markets. 1994. Three first chapters.	
CS30A1500	TRANSPORTATION SYSTEMS	5 ECTS cr
	Transportation Systems, Kuljetusjärjestelmät	
Year and Period	M.Sc. (Tech.) 1-2, Period 4 int.	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli-Pekka Hilmola	
Aims	Finland's logistical position in Europe as well as in the global context. Course will give basic understanding from different transportation modes (air, road, sea and rail), and their relation to users (e.g. companies) financial and non-financial performance. Combining different modes of transportation to represent overall transportation service (e.g. automation and containers). Role of Russia and Asia in the transportation flows of Europe. Third party logistics solutions. Value enhancement in logistical services and processes, M&A waves, and the reasons for service provider integration.	
Content	Among lectures, course contains case exercises (which will combine the issues of different transportation modes together), and by participating in all of these, student will have some amount of basic points for exam.	
Modes of Study	Lectures 14 h and cases 12 h as intensive teaching in the 4th period.	
Evaluation	0-5, examination (70 %) ja accepted case exercises (30 %).	
Study materials	1. Häkkinen, Lotta (2005). Operations Integration and Value Creation in Horizontal Cross-Border Acquisitions. Turku School of Economics and Business Administration, A-6 (Doctoral Diss.). Available at URL: http://www.tukkk.fi/julkaisut/vk/Ae6_2005.pdf 2. Woxenius, Johan (1998). Development of Small-Scale Intermodal Freight Transportation in a System Context. Chalmers University of Technology, Report 34 (Doctoral Diss.). Available at URL: http://www.mot.chalmers.se/staff/johwox/_private/English/Reports/1998%20Dissertation%20Woxenius.pdf 3. Hilmola, Olli-Pekka, Ulla Tapaninen, Erik Terk & Ville-Veikko Savolainen (2007). Container Transit in Finland and Estonia – Current Status, Future Demand and Implications on Infrastructure Investments in Transportation Chain. Publications from the Centre for Maritime Studies, University of Turku, A44. Available at URL: http://www.okt-	

Prerequisites	<p>infra.fi!/file/lid199/files/attachment/OKT_Infra_Cont_Report.pdf</p> <p>4. Terk, Erik, Ulla Tapaninen, Olli-Pekka Hilmola & Tonis Hunt (2007). Oil Transit in Estonia and Finland – Current Status, Future Demand, and Implications on Infrastructure Investments in Transportation Chain. Publications of Estonian Maritime Academy, No. 4, 2007. Available at URL: http://www.okt-infra.fi!/file/lid206/files/attachment/OKT_Infra_Oil_Report_a.pdf</p> <p>5. Ivanova, Oksana, Tero Toikka & Olli-Pekka Hilmola (2006). Eurasian Container Transportation Market: Current Status and Future Development Trends with Consideration of Different Transportation Modes. Lappeenranta University of Technology, Department of Industrial Engineering and Management. Research Report 179. Available at URL: http://kouvola.lut.fi!/file/lid980/files/attachment/Research_Report_179_Nora.pdf</p> <p>6. Additional material provided by the lecturer (notes, articles and case exercises).</p> <p>Recommended to have taken some logistical courses before, e.g. from topics of supply chain management and production control.</p>
CS34A0400	STRATEGIC ENTREPRENEURSHIP IN AGE OF 5 ECTS cr UNCERTAINTY
Year and Period Teacher(s) Content Modes of Study Evaluation Study materials	<p>Strategic Entrepreneurship in Age of Uncertainty, Strateginen yrittäjyys ja epävarmuuden hallinta</p> <p>M.Sc. (Tech.) 2, Period 1 Professor, D.Sc. (Tech.) Marko Torkkeli</p> <p>Must know: This course examines issues related entrepreneurship and entrepreneurial mindset. Entrepreneurial mindset. Identifying opportunities. Management of market and technology uncertainty.</p> <p>Lectures 28 h, 1. period. 0-5, a written report.</p> <p>Lectures. McGrath Rita and MacMillan Ian, (2000). The Entrepreneurial Mindset. Harvard Business School Pr.</p>
CS34A0500	TECHNOLOGY COMMERCIALIZATION AND CORPORATE VENTURING 5 ECTS cr
Year and Period Teacher(s) Aims Content Modes of Study Evaluation Study materials	<p>Technology Commercialization and Corporate Venturing, Teknologian kaupallistaminen</p> <p>M.Sc. (Tech.) 1-2, Period 4 int. Professor, D.Sc. (Tech.) Marko Torkkeli Visiting lecturers</p> <p>To understand the characteristics of technology commercialization and high growth technology ventures.</p> <p>This course examines issues related technology commercialization, corporate venturing, and ways to profitably exploit business opportunities. Business models. Suitable also for postgraduate studies.</p> <p>Lectures and guest speakers 28 h as intensive teaching in the 4th period. Written report.</p> <p>0-5. Written report 100 %.</p> <p>Lectures and course pack. Block Zenas and MacMillan Ian (1985) Corporate Venturing: Creating New Businesses Within the Firm. Harvard Business School Pr. McGrath Rita and MacMillan Ian, (2005). MarketBusters: 40 Strategic Moves That Drive Exceptional Business Growth. Harvard Business School Pr.</p>

4.6. Master's Degree Programme in Technomathematics and Technical Physics

The Master's Degree Programme in Technomathematics and Technical Physics corresponds to 120 ECTS credits and leads to the degree of Master of Science in Technology. This two-year M.Sc. programme is meant for both Finnish and international students. Lectures and tutoring are given in English. The M.Sc. programme has two alternative major subjects, Technomathematics and Technical Physics.

Technomathematics

Programme Coordinator in Technomathematics is lecturer, Ph.D. Matti Heiliö

Students majoring in Technomathematics should have a Bachelor's degree in engineering, applied mathematics, computer science or equivalent discipline. The aim is to develop the student's mathematical and computational skills for industry and other research and development tasks. The professional scope is wide-ranging and growing rapidly. Technomathematics is the art and science of applying mathematics and computational models into real life problems in industrial research and applied science, such as

- measurements, experiments and intelligent data-analysis
- modelling and simulation of systems and processes
- production management and process monitoring/control
- financial models, risk analysis and decision support systems

We train our graduates to combine modeling, computational skills, advanced theory and data analysis in innovative ways. We provide solutions to questions of industrial R&D. Some examples of applications and research areas: inverse problems, stochastic methods, Bayesian methods with MCMC, fuzzy logic and systems, fuzzy methods in knowledge engineering, data assimilation techniques, computational fluid dynamics, wavelets and image/signal analysis, data intensive methods in weather models, forest inventory and environmental monitoring.

Education in applied mathematics at LUT is international. One of our goals is the development of university pedagogy in applied mathematics education. We also provide the student with a capability for doctoral studies and independent research.

Requirements for Basic Studies

Students who choose the major in Technomathematics are expected to have a B.Sc. in applied mathematics, computer science or information technology. The students should have basic knowledge in computing including data structures and some programming skills. Furthermore, the students must have familiarity with PC work stations and basic data manipulation tools.

Regarding mathematics the student should master calculus, also in functions of several variables. He/she is assumed to know basics of matrices, linear algebra, differential equations and optimization, numerical algorithms, statistics and probability. Knowledge of discrete models, fuzzy models and methods is of great advantage. The student should have knowledge in physics covering basic phenomena in mechanics, electricity, thermal and wave phenomena. Independence, team work and communication skills are important. As tuition is given in English, the students must have good oral and writing skills in the English language.

Degree Structure

General Studies	9	ECTS cr
Major Subject, obligatory studies	13	ECTS cr
Major Subject, elective modules	30	ECTS cr
Minor Subject	20	ECTS cr
Elective Studies	18	ECTS cr
Master's Thesis and Seminar	30	ECTS cr
<i>Total</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

General Studies 9 ECTS cr

<i>Obligatory Studies (9 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0300 Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3 M.Sc. (Tech.) 1-2 B.Sc. (Econ. & Bus. Adm.) 2-3	1, 2, 3, 4	2
FV11A8900 Academic Writing in English	M.Sc. (Econ. & Bus. Adm.) 1-2 B.Sc. (Tech.) 3 M.Sc. (Tech.) 1-2 B.Sc. (Econ. & Bus. Adm.) 3	1-2, 3-4	4
FV18A9101 Finnish 1	M.Sc. (Econ. & Bus. Adm.) 1-2	1, 3	2

Major Subject, obligatory studies 13 + 30 ECTS cr

<i>Obligatory Studies (43 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2101 Differential Equations	M.Sc. (Tech.) 1-2	3	5
BM20A2500 Linear Algebra and Normed Spaces	M.Sc. (Tech.) 1-2	1	3
BM20A4000 Case Study Seminar	M.Sc. (Tech.) 1	1-4	5
Thesis Master's Thesis and Seminar			30

Major Subject, elective modules 30 ECTS cr

Choose two modules from a-d. The extent of each module should be at least 15 ECTS cr.

a) Computational Modelling of Technical Systems

<i>Obligatory Studies (7 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2701 Numerical Methods II	M.Sc. (Tech.) 1	4	3
BM20A2800 Nonlinear Optimization	M.Sc. (Tech.) 1-2	4	4

<i>Elective Studies</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2000 Simulation	M.Sc. (Tech.) 1	1	4
BM20A2600 Integral Transforms	B.Sc. (Tech.) 3	4	3
BM20A3201 Fuzzy Engineering	M.Sc. (Tech.) 1-2	4	5
BM20A3801 Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6
BM20A4200 Applied Functional Analysis	M.Sc. (Tech.) 1-2	2-3	5
BM20A4500 Evolutionary Computation	M.Sc. (Tech.) 1-2		5

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b) Data Analysis and Stochastics

<i>Obligatory Studies (8 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A1900	Statistics II	M.Sc. (Tech.) 1-2	2	3
BM20A3001	Statistical Analysis in Modelling	M.Sc. (Tech.) 1	2	5

<i>Elective Studies</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2000	Simulation	M.Sc. (Tech.) 1	1	4
BM20A2901	Discrete Optimization	M.Sc. (Tech.) 1-2	4	5
BM20A3301	Stochastic Theory and Models	M.Sc. (Tech.) 1	4	3-5
BM20A3401	Design of Experiments	M.Sc. (Tech.) 1-2	3	4
BM20A3601	Fuzzy Data Analysis	M.Sc. (Tech.) 1-2	3	5
BM20A3801	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6
BM20A4500	Evolutionary Computation	M.Sc. (Tech.) 1-2	2	5

c) Discrete and Fuzzy Models and Methods

<i>Obligatory Studies (6 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A3101	Fuzzy Sets and Fuzzy Logic	M.Sc. (Tech.) 1-2	1-2	6

<i>Elective Studies</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2201	Logic and Discrete Methods	M.Sc. (Tech.) 1	4	4
BM20A2901	Discrete Optimization	M.Sc. (Tech.) 1-2	4	5
BM20A3201	Fuzzy Engineering	M.Sc. (Tech.) 1-2	4	5
BM20A3601	Fuzzy Data Analysis	M.Sc. (Tech.) 1-2	3	5
BM20A3801	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6

d) Theory of Applied Analysis

<i>Obligatory Studies (8 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2600	Integral Transforms	B.Sc. (Tech.) 3	4	3
BM20A4200	Applied Functional Analysis	M.Sc. (Tech.) 1-2	2-3	5

<i>Elective Studies</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A1300	Complex Analysis	M.Sc. (Tech.) 1-2	1	3
BM20A1900	Statistics II	M.Sc. (Tech.) 1-2	2	3
BM20A2701	Numerical Methods II	M.Sc. (Tech.) 1	4	3
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1-2	4	4
BM20A2901	Discrete Optimization	M.Sc. (Tech.) 1-2	4	5
BM20A3101	Fuzzy Sets and Fuzzy Logic	M.Sc. (Tech.) 1-2	1-2	6
BM20A3301	Stochastic Theory and Models	M.Sc. (Tech.) 1	4	3-5
BM20A3801	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6

Minor Subject 20 ECTS cr

Students can choose any minor subject taught at LUT if the required prerequisites are completed. Minor in Intelligent Computing is recommended only for the students of Technomathematics. The choice of the minor subject should be discussed with the Programme Coordinator in Technomathematics.

Minor: Intelligent Computing. Recommended for Technomathematics Students only

<i>Choose minimum 20 credits</i>		<i>per.</i>	<i>ECTS cr</i>
CT50A4000	Introduction to Intelligent Computing	3-4	5
CT50A5700	Introduction to Computer Graphics	2	5
CT50A6000	Pattern Recognition	3-4	7
CT50A6100	Machine Vision and Digital Image Analysis	1-2	7
CT50A6200	Computer and Robot Vision	1-2	7

Elective Studies 18 ECTS cr

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise. The student should discuss the choice of elective courses with the Programme Coordinator.

Master's Thesis and Seminar 30 ECTS cr

Thesis topics arise from various application areas, research projects and contacts with industry. Typically, the thesis contains a theoretical study, as well as the use of up-to-date mathematical and computational methods for solving an application practical problem.

Minor in Technomathematics 20 ECTS cr

Minor in Technomathematics can be studied by students of other Master's degree programmes. Courses for minor studies can be freely chosen from the courses that Laboratory of Applied Mathematics offers in English. However, suitable background knowledge is needed. This means basic knowledge about matrix calculation, optimization, statistics, numerical analysis and especially mathematical programming with some procedural language (preferably Matlab/Octave).

A minimum of 20 ECTS credits should be selected from the courses below:

<i>Minor Studies min. 20 ECTS cr</i>		<i>per.</i>	<i>ECTS cr</i>
BM20A1300	Complex Analysis	1	3
BM20A1900	Statistics II	2	3
BM20A2000	Simulation	1	4
BM20A2101	Differential Equations	3	5
BM20A2201	Logic and Discrete Methods	4	4
BM20A2500	Linear Algebra and Normed Spaces	1	3
BM20A2600	Integral Transforms	4	3
BM20A2701	Numerical Methods II	4	3
BM20A2800	Nonlinear Optimization	4	4
BM20A2901	Discrete Optimization	4	5
BM20A3001	Statistical Analysis in Modelling	2	5
BM20A3101	Fuzzy Sets and Fuzzy Logic	1-2	6
BM20A3201	Fuzzy Engineering	4	5
BM20A3301	Stochastic Theory and Models	4	3-5
BM20A3401	Design of Experiments	3	4
BM20A3601	Fuzzy Data Analysis	3	5
BM20A3801	Advanced Mathematical Methods	1-4	3-6
BM20A3900	Modelling Methodology in Process Engineering	1-2	6
BM20A4200	Applied Functional Analysis	2-3	5
BM20A4500	Evolutionary Computation	2	5

Technical Physics

Programme Coordinator in Technical Physics is professor, Ph.D. Erkki Lähderanta

Students majoring in Technical Physics should have a Bachelor's degree from a related field. For every admitted student will be composed a personal study plan. The contents of the plan depend on the student's previous degree/studies and his field of interest and specialization.

The aim of the major subject Technical Physics is to prepare the student professionally and academically in physics and other technical science skills in industry and R&D tasks. The M.Sc. programme also provides the student with readiness for postgraduate studies and independent research.

Degree Structure

General Studies	9	ECTS cr
Major Subject	35-38	ECTS cr
Minor Subject	20	ECTS cr
Elective Studies	23-26	ECTS cr
Master's Thesis and Seminar	30	ECTS cr
<i>Total</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

General Studies 9 ECTS cr

<i>Obligatory Studies (9 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0300 Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3 M.Sc. (Tech.) 1-2 B.Sc. (Econ. & Bus. Adm.) 2-3 M.Sc. (Econ. & Bus. Adm.) 1-2	1, 2, 3, 4	2
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3 M.Sc. (Tech.) 1-2 B.Sc. (Econ. & Bus. Adm.) 3 M.Sc. (Econ. & Bus. Adm.) 1-2	1-2, 3-4	4
FV18A9101 Finnish 1		1, 3	2

Major Subject 65-68 ECTS cr

<i>Obligatory Studies (65-68 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BL50A0600 Electromagnetic Compatibility in Power Electronics	M.Sc. (Tech.) 1	1	2
BM30A0500 Applied Optics	M.Sc. (Tech.) 1	2	6
BM30A0601 Optoelectronics	M.Sc. (Tech.) 1	1	6
BM30A1500 Advanced Topics in Material Science	M.Sc. (Tech.) 2	2	6
BM30A1600 Microelectronics	M.Sc. (Tech.) 1	1	6
BM30A1700 Physics of Semiconductor Devices	M.Sc. (Tech.) 1-2	1-2	3-6
BM30A2200 Semiconductor and Superconductor Physics	M.Sc. (Tech.) 1	1-2	6
Thesis Master's Thesis and Seminar			30

Minor Subject 20 ECTS cr

Students can choose any minor subject taught at LUT if the required prerequisites are completed. The choice of the minor subject should be discussed with the Programme Coordinator in Technical Physics.

Elective Studies 23-26 ECTS cr

Elective studies can include any courses offered by LUT if the required prerequisites are completed. Studies in other universities may be included upon application. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise. The student should discuss the choice of the elective courses with the Programme Coordinator.

Master's Thesis and Seminar 30 ECTS cr

Thesis topics arise from various application areas, research projects and contacts with different universities. Typically, the thesis contains a theoretical study, experimental part and analysis of the experimental results.

Minor in Technical Physics 20-26 ECTS cr

Minor in Technical Physics can be studied by students of other Master's Degree programmes.

Minimum 20 ECTS credits should be selected.

<i>Minor Studies min. 20 ECTS cr</i>		<i>per.</i>	<i>ECTS cr</i>
BM30A0500 ^(*)	Applied Optics	2	6
BM30A1500 ^(*)	Advanced Topics in Material Science	2	6
BM30A1600 ^(*)	Microelectronics	1	6
BM30A2100	Microelectronics Processing Technology	1-2	2
BM30A2200	Semiconductor and Superconductor Physics	1-2	6

^(*) Choose a min. of two courses.

Additional Information

Personal Study Plans

At the beginning of their studies, students prepare a personal study plan, in which the student and the contact persons of the degree programme agree on what studies the student will pursue and in what order. This plan includes detailed information on the major subject, minor subject, general studies, elective studies, credit transfer from previous degree/studies and possible complementary studies.

Credit Transfers

ECTS credits can be transferred from the student's previous university level studies or higher university degrees from Finnish or foreign universities. More information on credit transfer is available from Study Coordinator.

Complementary Studies (20-60 ECTS cr)

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree. The course FV13A1200 Teknisk svenska 2 ECTS cr is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.

Further Information

Programme Coordinator in Technomathematics:
Lecturer, Ph.D. Matti Heiliö
Phone +358 5 621 2805, room 1343, matti.heilio(at)lut.fi

Programme Coordinator in Technical Physics:
Professor, Ph.D. Erkki Lähderanta
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Study Coordinator, Faculty of Technology:
Ms. Minna Loikkanen
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The Courses Offered in English

		<i>ECTS cr</i>
BM20A1300	Complex Analysis	3
BM20A1900	Statistics II	3
BM20A2000	Simulation	4
BM20A2101	Differential Equations	5
BM20A2201	Logic and Discrete Methods	4
BM20A2500	Linear Algebra and Normed Spaces	3
BM20A2600	Integral Transforms	3
BM20A2701	Numerical Methods II	3
BM20A2800	Nonlinear Optimization	4
BM20A2901	Discrete Optimization	5
BM20A3001	Statistical Analysis in Modelling	5
BM20A3101	Fuzzy Sets and Fuzzy Logic	6
BM20A3201	Fuzzy Engineering	5
BM20A3301	Stochastic Theory and Models	3 - 5
BM20A3401	Design of Experiments	4
BM20A3601	Fuzzy Data Analysis	5
BM20A3801	Advanced Mathematical Methods	3 - 6
BM20A3900	Modelling Methodology in Process Engineering	6
BM20A4000	Case Study Seminar	5
BM20A4200	Applied Functional Analysis	5
BM20A4500	Evolutionary Computation	5
BM30A0500	Applied Optics	6
BM30A0601	Optoelectronics	6
BM30A1500	Advanced Topics in Material Science	6
BM30A1600	Microelectronics	6
BM30A1700	Physics of Semiconductor Devices	3 - 6
BM30A2100	Microelectronics Processing Technology	2
BM30A2200	Semiconductor and Superconductor Physics	6

BM20A1300	COMPLEX ANALYSIS	3 ECTS cr
	Complex Analysis, Kompleksianalyysi	
	The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Pasi Luukka	
Aims	Give the students the necessary knowledge of complex analysis needed in technical applications.	
Content	Complex number arithmetics and roots. Complex functions, also as mappings of complex plane. Derivative of a complex function and analytical functions. Complex integration, Cauchy's theorem and Residue theorem.	
Modes of Study	Lectures 28 h, exercises 14 h, 1st period. Exam.	
Evaluation	0-5, examination 100%.	
Study materials	Kreyszig, E.: Advanced Engineering Mathematics, 8th Ed., Part D.	
Prerequisites	Recommended Mathematics A and B.	

BM20A1900	STATISTICS II	3 ECTS cr
	Statistics II, Tilastomatematiikka II	
Year and Period	M.Sc. (Tech.) 1-2, Period 2	
Teacher(s)	Lecturer, Ph.D. Matti Heiliö	
Aims	To give deeper understanding about statistical methods and their applications to various areas in technology, economics and science.	

Content	Statistical inference: hypothesis testing, two sample tests. Nonparametric tests. Basics of analysis of variance, time series analysis and multiple regression models. Introduction to nonlinear regression. Elements decision theory. Introduction to multivariate methods. Principal component analysis. Suitable also for postgraduate studies.
Modes of Study	Lectures 28 h, exercises 14 h, home assignments, 2nd period. Exam.
Evaluation	0-5, examination 70%, home assignments 30%.
Study materials	Will be announced at lectures.
Prerequisites	Recommended BM20A1401 Tilastomatemiikka I.

BM20A2000	SIMULATION	4 ECTS cr
	Simulation, Simulointi	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, Ph.D. Heikki Haario	
Aims	The course gives an introduction to the concepts of discrete simulation models and methods together with numerical examples.	
Content	Basic concepts, discrete and continuous systems. Random numbers, discrete event generation by random numbers. Statistical and empirical distributions for event generation. Application examples: queuing systems, storage size optimization. Building numerical simulation examples with Matlab. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 14 h, practical assignment, 1st period. Exam.	
Evaluation	0-5, examination 100%. Practical assignment.	
Prerequisites	Recommended BM20A1401 Tilastomatemiikka I.	

BM20A2101	DIFFERENTIAL EQUATIONS	5 ECTS cr
	Differential Equations, Differentiaaliyhtälöt	
	The course will be lectured every second year, next time during the academic year 2009 - 2010.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	
Teacher(s)	Professor, Ph.D. Heikki Haario	
Aims	The course introduces the basic concepts of ordinary and partial differential equations together with numerical solution methods.	
Content	Linear and nonlinear ordinary differential equations. Initial and boundary value problems. Stability and phase space presentation of solutions. Numerical solutions for ordinary differential equations with Matlab solvers. Basic types of partial differential equations: advection, diffusion/heat, wave equations. Numerical solutions with semidiscretization methods. Modelling examples from different engineering fields.	
Modes of Study	Lectures 28 h, exercises 28 h, 3rd period. Exam.	
Evaluation	0-5, examination 100%.	
Prerequisites	Mathematics A and B.	

BM20A2201	LOGIC AND DISCRETE METHODS	4 ECTS cr
	Logic and Discrete Methods, Logiikka ja diskreetit menetelmät	
	Replaces the course BM20A2200 Logic and Discrete Methods.	
Year and Period	M.Sc. (Tech.) 1, Period 4	
Teacher(s)	Adjunct Professor, Ph.D. Jorma Mattila	
Aims	To introduce essential methods of logic and discrete mathematics for computer science. A student can use these methods in formal environments of computer science and related topics.	
Content	The course consists of classical logic and resolution method, some basic things	

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Modes of Study	of non-classical logics, inductive, recursional and relational methods for computer science. An algebraic approach to discrete methods is considered.
Evaluation	Suitable also for postgraduate studies.
Study materials	Self study material, exam. 0-5, examination 100%. Grassmann, W.K., Tremblay J-P.: Logic and Discrete Mathematics. A Computer Science Perspective, Prentice Hall, 1996.
BM20A2500	LINEAR ALGEBRA AND NORMED SPACES 3 ECTS cr
	Linear Algebra and Normed Spaces, Lineaarialgebra ja normiavaruudet
Year and Period	M.Sc. (Tech.) 1-2, Period 1
Teacher(s)	Lecturer, Ph.D. Matti Heiliö
Aims	Essentials of linear analysis in normed spaces and principles which are needed to understand methods of applied mathematics.
Content	Vector spaces and linear operators. Linear subspaces and projection. Norms, metric and convergence. Function spaces. Banach spaces, L _p -spaces. Inner product and orthogonality. Hilbert spaces. Theory of linear operators, eigenvalues and spectral decomposition. Introduction to wavelet analysis. Applications in systems and signal analysis, numerical methods, optimization. Suitable also for postgraduate studies.
Modes of Study	Lectures 21 h, exercises 14 h, 1st period. Exam.
Evaluation	0-5, examination 100%.
Study materials	Lay, D.: Linear Algebra and its Applications, Addison-Wesley, 2000. Kreyszig, E.: Introductory Functional Analysis with Applications, Wiley, 1989. Reddy, B.D.: Introductory Functional Analysis, with applications to Boundary Value Problems and Finite Elements, Springer, 1998.
Prerequisites	Recommended BM20A1601 Matriisilaskenta.
BM20A2600	INTEGRAL TRANSFORMS 3 ECTS cr
	Integral Transforms, Integraalimuunnokset
Year and Period	B.Sc. (Tech.) 3, Period 4
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Pasi Luukka
Aims	To show how different transform techniques are used in order to solve certain engineering problems.
Content	Laplace transform, Fourier transform, z-transform. Examples of applications of transforms in engineering problem solving.
Modes of Study	Lectures 28 h, exercises 14 h, 4th period. Exam.
Evaluation	0-5, examination 100%.
Study materials	Kreyszig, E.: Advanced Engineering Mathematics, Wiley, 1999. James, G.: Advanced Modern Engineering Mathematics, Addison-Wesley, 2003.
Prerequisites	Recommended Mathematics A and B.
BM20A2701	NUMERICAL METHODS II 3 ECTS cr
	Numerical Methods II, Numeeriset menetelmät II
	Replaces the course BM20A2700 Numerical Analysis I.
Year and Period	M.Sc. (Tech.) 1, Period 4
Teacher(s)	Professor, Ph.D. Heikki Haario
Aims	An introduction to numerical methods for differentiation, integration, interpolation and differential equations. Numerical methods for linear systems.
Content	Numerical differentiation and integration. Interpolation methods in 1D and 2D. Numerical matrix calculations with applications. Over- and underdetermined linear systems, singular values of a matrix, principal components. Ill-posed linear problems and regularized solutions.

Modes of Study	Lectures 21 h, exercises 14 h, 4th period. Exam.
Evaluation	0-5, examination 100%.
Study materials	Will be announced at lectures.
Prerequisites	Mathematics A and B. Recommended BM20A1501 Numeeriset menetelmät I.

BM20A2800	NONLINEAR OPTIMIZATION	4 ECTS cr
	Nonlinear Optimization, Epälineaarinen optimointi	
	The course will be lectured every second year, next time during the academic year 2009 - 2010.	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Teacher(s)	Lecturer, Lic.Phil. Sirkku Parviainen	
Aims	The course introduces the concepts of nonlinear optimization and provides the basic skills for formulating and solving nonlinear optimization tasks.	
Content	Formulation of optimization models. Classification of optimization problems. Optimization of a function of one variable. Optimality criteria in unconstrained and constrained optimization. Line search methods, unconstrained multivariate optimization methods. Methods for constrained optimization. Methods for global optimization. Principles of evolutionary algorithms. Introduction to stochastic optimization. Optimization software tools, examples with Matlab. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 14 h, 4th period. Practical assignment. Exam.	
Evaluation	0-5, examination 100%. Practical assignment.	
Study materials	Nocedal, J. and Wright, S. J.: Numerical Optimization, Springer, 2006.	
Prerequisites	Experience in programming or using mathematical software required. BM20A4301 Johdatus tekniseen laskentaan Mathematics A and B, BM20A1501 Numeeriset menetelmät I.	

BM20A2901	DISCRETE OPTIMIZATION	5 ECTS cr
	Discrete Optimization, Diskreetti optimointi	
	The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Teacher(s)	Lecturer, Lic.Phil. Sirkku Parviainen	
Aims	To introduce the student to discrete or combinatorial optimization methods and problems.	
Content	Discrete optimization problems. Algorithms and computational complexity. Polynomial-time problems and NP-complete problems. Integer linear programming. Assignment problem. Traveling salesman problem: solution with branch&bound and heuristic methods. Routing and packing problems: solution with heuristics and dynamic programming. Principles of genetic algorithms and simulated annealing methods in discrete optimization. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 28 h, 4th period. Practical assignment. Exam.	
Evaluation	0-5, examination 100%. Practical assignment.	
Study materials	Will be announced at lectures.	
Prerequisites	Experience in programming or using mathematical software required. BM20A4301 Johdatus tekniseen laskentaan Recommended BM20A1801 Lineaarinen optimointi.	

BM20A3001	STATISTICAL ANALYSIS IN MODELLING	5 ECTS cr
	Statistical Analysis in Modelling, Mallien tilastollinen analyysi	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	Professor, Ph.D. Heikki Haario	
Aims	Introduction to the methods of estimating reliability of modelling.	
Content	Errors and uncertainty in experimental data. Uncertainty in model parameters and prediction results. Bayesian approach for parameter estimation and inverse problems, various Monte Carlo (MCMC) methods for nonlinear models. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 28 h, 2nd period. Practical assignment. Exam.	
Evaluation	0-5, examination 100%. Practical assignment.	
Prerequisites	Mathematics A and B, BM20A1401 Tilastomatematiikka I. Recommended BM20A2000 Simulation.	
BM20A3101	FUZZY SETS AND FUZZY LOGIC	6 ECTS cr
	Fuzzy Sets and Fuzzy Logic, Sumeat joukot ja sumea logiikka	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Adjunct Professor, Ph.D. Jorma Mattila	
Aims	To introduce mathematics of fuzzy systems. The student will learn the relations between crisp and fuzzy sets and those between algebras of crisp and fuzzy sets, some function algebras, lattices of membership functions and the basic things of L-sets. The student will learn also non-classical logics and some basic things of mathematical fuzzy logic.	
Content	The course consists of concept of fuzziness, some algebras of fuzzy sets, fuzzy quantities, logical aspects of fuzzy sets, operations of fuzzy sets, relations, universal approximation, fuzzy compositional calculus, fuzzy ranking, aggregation operators, fuzzy screening systems, averaging operators and modifier operations. Suitable also for postgraduate studies.	
Modes of Study	Lectures 56 h, exercises 28 h, 1st-2nd period. Exam.	
Evaluation	0-5, examination 100%.	
Study materials	Nguyen, H.T., Walker, E.A.: A First Course in Fuzzy Logic, 2nd Ed., Chapman & Hall/CRC, 2000. Klir, G., Yuan, B.: Fuzzy Sets and Fuzzy Logic. Theory and Applications, Prentice Hall, 1995. Fullér, R.: Introduction to Neuro-Fuzzy Systems, Physica-Verlag, 2000. Carlsson C. and Fullér, R.: Fuzzy Reasoning in Decision Making and Optimization, Physica-Verlag, 2002.	
Prerequisites	Bachelor level basic math courses.	
BM20A3201	FUZZY ENGINEERING	5 ECTS cr
	Fuzzy Engineering, Sumea teknologia	
	The course will be lectured every second year, next time during the academic year 2009 - 2010.	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Teacher(s)	Adjunct Professor, Ph.D. Jorma Mattila	
Aims	To introduce fuzzy systems in engineering environment. The student will learn function approximation methods with fuzzy systems and how to model and solve control problems and neuro-Fuzzy systems.	
Content	Fuzzy sets and relations, fuzzy functions and rule-based systems, mamdani fuzzy system and Sugeno-Tagaki fuzzy system, universal approximators, fuzzy modelling, fuzzy control, fuzzy controllers in applications. Some image processing techniques. Neuro-Fuzzy systems. Suitable also for postgraduate studies.	

Modes of Study	Lectures 28 h, exercises 14 h, 4th period. Practical assignment. Exam.
Evaluation	0-5, examination 100%. Practical assignment.
Study materials	Fullér, R.: Introduction to Neuro-Fuzzy Systems, Physica-Verlag, 2000. Kosko, B.: Fuzzy Engineering, Prentice-Hall, 1996. Passino, K.M., Yurkovich, S.: Fuzzy Control, Addison-Wesley, 1998.
Prerequisites	Recommended BM20A3101 Fuzzy Sets and Fuzzy Logic.

BM20A3301	STOCHASTIC THEORY AND MODELS	3 - 5 ECTS cr
	Stochastic Theory and Models, Stokastiikan teoriaa ja malleja	
Year and Period	M.Sc. (Tech.) 1, Period 4	
Teacher(s)	Lecturer, Ph.D. Matti Heiliö	
Aims	To present theory of stochastics and advanced statistical methods for understanding systems and phenomena containing randomness and uncertainty.	
Content	Theory of stochastics applicable to modelling and analysing systems where randomness is inherent in a non-trivial way. Stochastic processes, conditional expectations and martingales. Brownian motion, introduction to Ito-integral and stochastic differential equations. Time series and ARMA-models. Regression and linear statistical models. Analysis and identification of nonlinear statistical models. Bayesian methods. Suitable also for postgraduate studies.	
Modes of Study	Lectures 14 h, exercises 14 h, project assignment, self-study material, 4th period. The course is also available as virtual web-course (in Finnish). Exam.	
Evaluation	0-5, examination 50%, project assignment 50%.	
Study materials	Will be announced at lectures.	
Prerequisites	BM20A1401 Tilastomatematiikka I. Recommended BM20A1900 Statistics II, BM20A2500 Linear Algebra and Normed Spaces.	

BM20A3401	DESIGN OF EXPERIMENTS	4 ECTS cr
	Design of Experiments, Koesuunnittelu	
	The course will be lectured every second year, next time during the academic year 2009 - 2010.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	
Teacher(s)	Professor, Ph.D. Heikki Haario	
Aims	Introduction to the basic concepts for efficient planning of experiments.	
Content	Importance of experimental design, minimization of prediction uncertainty. Basic factorial designs: 2 ^N , Central Composite designs for regression analysis. Variance analysis for qualitative factors. The Taguchi principles. Experimental optimisation of engineering processes. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 14 h, project work, 3rd period. Exam.	
Evaluation	0-5, examination 100%. Project work.	
Prerequisites	Mathematics A and B, BM20A1401 Tilastomatematiikka I.	

BM20A3601	FUZZY DATA ANALYSIS	5 ECTS cr
	Fuzzy Data Analysis, Data-analyysiä sumeassa ympäristössä	
	The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Pasi Luukka	
Aims	To introduce theoretical aspects of data analysis. The student will learn how to model and analyze uncertainty in different problem settings.	

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Content	Fuzzy sets and relations. Uncertainty measures. Qualitative and quantitative analysis of fuzzy data. Introduction to possibility theory and generalized measure theory. Principles of individual multiperson, multicriteria and multiddecision making, fuzzy interpolation, fuzzy principle component analysis, fuzzy clustering and classification, fuzzy regression analysis. Evaluation of methods. Suitable also for postgraduate studies.
Modes of Study	Lectures 28 h, exercises 28 h, 3rd period. Practical assignment. Exam.
Evaluation	0-5, examination 100%. Practical assignment.
Study materials	Bandemer, H., Näther, W.: Fuzzy Data Analysis, Kluwer Academic Publ., 1992.
Prerequisites	Recommended BM20A3101 Fuzzy Sets and Fuzzy Logic.

BM20A3801	ADVANCED MATHEMATICAL METHODS	3 - 6 ECTS cr
	Advanced Mathematical Methods, Matemaattisten menetelmien erikoiskurssi	
	Replaces the course BM20A3800 Advanced Mathematical Methods.	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Lecturer, Ph.D. Matti Heiliö	
Aims	The student will obtain theoretical and operational skills in some specific area of applied mathematics.	
Content	The course will demand reading literature, working on exercises and practical projects. Material will be individually chosen according to the focus of the study module, students' interests and research task. The topic may be for example optimization, numerical methods, PDE:s, stochastics, theory of algorithms, wavelets, filtering, systems analysis, mathematics of finance etc. The course with the same title can be included in the study programme twice when two distinct areas are covered. Suitable also for postgraduate studies.	
Modes of Study	Self study material, report.	
Evaluation	0-5, report 100%.	
Prerequisites	Recommended BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta.	

BM20A3900	MODELLING METHODOLOGY IN PROCESS ENGINEERING	6 ECTS cr
	Modelling Methodology in Process Engineering, Mallinnus prosessiteknikassa	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Researcher/Teacher, Ph.D. Tuomo Kauranne	
Aims	The course provides an overview to the concepts and techniques of mathematical modelling in process engineering.	
Content	Types of modelling: empirical and physicochemical models and the use of them. Measurement of uncertainty in experimental data. Basic concepts of regression methods for empirical models. Building physicochemical models for engineering processes from first principles. How to employ various mathematical tools to formulate and numerically solve models. Least squares methods, curve fitting and parameter estimation. Examples from data analysis, process modelling, pulp and paper technology, chemical engineering, and signal processing among others. Examples and exercises with Matlab.	
Modes of Study	Lectures 21 h, exercises 14 h, 1st period.	
Evaluation	Lectures 21 h, exercises 14 h, 2nd period. Practical assignment. Exam.	
Study materials	0-5, examination 100%. Practical assignment. Giordano, Frank R. - Weir, Maurice D. - Fox, William P.: A first course in mathematical modeling, Brooks/Cole, 1997. Borrelli, R., Coleman, C.: Differential Equations: A Modeling Perspective, John Wiley & Sons, 2003.	

Prerequisites	Svobodny, T.: Mathematical Modeling for Industry and Engineering, Prentice Hall, 1998. Mathematics A and B. Recommended BM20A1401 Tilastomatematiikka I, BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta, BM20A2101 Differential Equations.
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BM20A4000	CASE STUDY SEMINAR	5 ECTS cr
	Case Study Seminar, Sovelletun matematiikan erikoistyöt	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professor, Ph.D. Heikki Haario	
Aims	The course gives an introduction to independent scientific work by presenting seminar works from different fields of applied mathematics.	
Content	The course works in a seminar form. Each student receives a project work topic and presents the problem as well as the work plan in the beginning. Typically, the topics cover modelling problems from different engineering fields, together with numerical solutions. Solution methods for the project work problems are discussed during the course. At conclusion, the participants present their project works. Suitable also for postgraduate studies.	
Modes of Study	Exercises 14 h, 1st period. Exercises 14 h, 2nd period. Exercises 14 h, 3rd period. Exercises 14 h, 4th period.	
Evaluation	Extended project work. Seminar is held in each period. Pass/fail. To pass the course student must attend 7 weeks and present his/her project work.	
Prerequisites	Mathematics A and B. Recommended BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta, BM20A3900 Modelling Methodology in Process Engineering.	

BM20A4200	APPLIED FUNCTIONAL ANALYSIS	5 ECTS cr
	Applied Functional Analysis, Sovellettu funktionaalianalyysi	
	The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 2-3	
Teacher(s)	M.Sc. (Tech.) Jouni Sampo	
Aims	To introduce some specific area of applied functional analysis. Topic may change every year. Academic year 2008-2009 subject was "Wavelet and multiscale transforms with applications".	
Content	Academic year 2008-2009: Elementaries of orthogonal and bi-orthogonal bases and frames, continuous and discrete wavelet transforms, properties of wavelet basis, multiresolution analysis, filter banks, implementation of wavelet transform in 1-D and 2-D, geometric multiscale transforms, applications (especially compression and denoising of signals and images). Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 14 h, 2nd period. Seminars 7 h and project work and seminar presentation, 3rd period. Exam.	
Evaluation	0-5, examination 100%. Project work and seminar presentation.	
Study materials	Will be announced at lectures.	
Prerequisites	Recommended BM20A2500 Linear Algebra and Normed Spaces.	

BM20A4500	EVOLUTIONARY COMPUTATION	5 ECTS cr
	Evolutionary Computation, Evoluutiolaskenta	
	The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 2	
Teacher(s)	Saku Kukkonen	
Aims	Familiarize with the basics and applications of evolutionary computation (EC). Learn to apply, implement, and modify evolutionary algorithms. Learn their application areas and restrictions. Learn to apply evolutionary algorithms to complex problems and to solve practical problems in the student's own specialization.	
Content	Introduction to evolutionary computation and its applications. Structure, components, and characteristics of evolutionary algorithms. Evolutionary problem solving, searching, and optimization. Different evolutionary algorithms, practical problem solving, and multiobjective optimization using evolutionary algorithms. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 14 h, project work and seminars (about 7 h), 2nd period. Exam.	
Evaluation	0-5, examination 100%. Project work.	
Study materials	Haupt, R. L., Haupt, S. E.: Practical Genetic Algorithms, Wiley, 1998. Eiben, A. E., Smith, J. E.: Introduction to Evolutionary Computing, Springer-Verlag, 2003. Price, K. S., Storn, R. M., Lampinen, J. A.: Differential Evolution, A Practical Approach to Global Optimization, Springer, 2005. Other material given at lectures.	
Prerequisites	Programming skill using some programming language is needed. The following courses might be helpful: CT60A0200 Ohjelmoinnin perusteet, CT60A0210 Käytännön ohjelmointi and CT50A2310 Tietorakenteet ja algoritmit.	
BM30A0500	APPLIED OPTICS	6 ECTS cr
	Applied Optics, Sovellettu optiikka	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	Researcher/Teacher, Ph.D. Erik Vartiainen	
Aims	The aims of the course are to describe basic optical phenomena and their applications particularly in the field of optical measurement technology and to provide the students with the skills to understand the operation of optical measurement instruments.	
Content	Ocular optics. Optical measurement instruments. Interferometry. Polarisation. Diffraction. Fourier optics. The optical properties of materials.	
Modes of Study	Lectures 42 h, tutorials 28 h, 2nd period. Written examination.	
Evaluation	0-5, examination 100%.	
Study materials	Pertti Silfsten: Sovellettu optiikka.	
Prerequisites	Students are recommended to have completed Physics or Physics L.	
BM30A0601	OPTOELECTRONICS	6 ECTS cr
	Optoelectronics, Optoelektroniikka	
	Replaces the course BM30A0600 Optoelektroniikka.	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, Ph.D. Tuure Tuuva	
Aims	To understand the basics of optical data communication.	

Content	Optical waveguides, light emitting devices and photodetectors. Suitable also for postgraduate studies.
Modes of Study	Lectures 35 h, exercises 14 h, 1st period. Examination.
Evaluation	0-5, examination 100%.
Study materials	Kasap, S. O.: Optoelectronics and Photonics P. Silfsten & E. Vartiainen: Optoelektroniikka,
Prerequisites	Physics or Physics L.

BM30A1500	ADVANCED TOPICS IN MATERIAL SCIENCE 6 ECTS cr
	Advanced Topics in Material Science, Moderni materiaalitiede
Year and Period	M.Sc. (Tech.) 2, Period 2
Teacher(s)	Visiting lecturers Person in Charge: Professor, Ph.D. Erkki Lähderanta
Aims	The aim of the course is to introduce students to selected topics of advanced physics, especially in the area of nanophysics.
Content	Nanophysics, applied superconductivity, ferroelectrics, other advanced topics in material science connected to nanophysics. Suitable also for postgraduate studies.
Modes of Study	Lectures and exercises 24 h, 2nd period.
Evaluation	Written assignment, 100%.
Study materials	To be given at lectures.
Prerequisites	BM30A2200 Semiconductor and Superconductor Physics

BM30A1600	MICROELECTRONICS 6 ECTS cr
	Microelectronics, Mikroelektroniikka
Year and Period	M.Sc. (Tech.) 1, Period 1
Teacher(s)	Person in Charge: Professor, Ph.D. Tuure Tuuva
Aims	To acquaint students with integrated circuit technology and provide them with skills for analog IC design. The students will learn the most important variables and functions related to the components of integrated circuits. Components will be modelled with simulation programs. The assignment of IC design will be carried out with a suitable design program.
Content	Semiconductor physics for the analysis of the operation of components. The geometry and design rules of IC components. PN junctions, MOS, BJT, and passive components in IC. Suitable also for postgraduate studies.
Modes of Study	Lectures 28 h, tutorials 28 h, 1st period. Assignment and its presentation. Written examination.
Evaluation	0-5, examination 100%. Satisfactorily completed assignment required.
Study materials	Roger T. Howe, Charles G. Sodini: Microelectronics An Integrated Approach.
Prerequisites	Recommended BL40A1710 Digitaalielektroniikka A and BL50A1400 Analogiaelektroniikka.

BM30A1700	PHYSICS OF SEMICONDUCTOR DEVICES 3 - 6 ECTS cr
	Physics of Semiconductor Devices, Puolijohdekomponenttien fysiikka
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2
Teacher(s)	Person in Charge: Professor, Ph.D. Tuure Tuuva
Aims	To provide the student with an in-depth knowledge of semiconductor devices and their operation.
Content	Structure, operation and physics of semiconductor devices. Suitable also for postgraduate studies.
Modes of Study	Special assignment, seminars 28 h, 1st-2nd period.
Evaluation	Pass/fail, special assignment 100%.
Study materials	Sze, Physics of Semiconductor Devices.

BM30A2100	MICROELECTRONICS PROCESSING TECHNOLOGY	2 ECTS cr
	Microelectronics Processing Technology, Mikropiirien valmistustekniikka	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Tuure Tuuva	
Aims	To provide the student with a knowledge of microelectronics processing technology and components.	
Content	Purification of semiconductor materials. Growth of semiconductor crystals and wafer preparation. Epitaxial layers, diffusion, ion implantation, oxidation, etching and photolithography. Semiconductor manufacturing and development.	
Modes of Study	Special assignment. Simulation studies of semiconductor processing using Silvaco Virtual Wafer Fab simulation program.	
Evaluation	0-5, special assignment 100%.	
Study materials	Plummer, J. D., Deal, M. D., Griffin, P. B., Silicon VLSI Technology: Fundamentals, Practice and Modeling.	
BM30A2200	SEMICONDUCTOR AND SUPERCONDUCTOR PHYSICS	6 ECTS cr
	Semiconductor and Superconductor Physics, Puolijohde- ja suprajohtefysiikka	
	Replaces the courses BM30A1000 Semiconductor Physics and BM30A1100 Superconductor Physics.	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Erkki Lähderanta	
Aims	The course gives the student the skills to understand the basic behaviour of semiconductors and superconductors.	
Content	Classical conductor, free-electron model of metals, energy bands, doped semiconductors, spintronics, basic properties of superconductivity, London equations, thermodynamics of the superconducting transition, the intermediate state, coherence length, current in superconductor, thin films, BCS-theory, type-II superconductors. Suitable also for postgraduate studies.	
Modes of Study	Lectures 42 h, exercises 28 h, 1st-2nd period.	
Evaluation	0-5, examination 100%.	
Study materials	Juha Sinkkonen: Puolijohdeteknologian perusteet. A. C. Rose-Innes and E. H. Rhoderick: Introduction to Superconductivity, 2nd edition (Pergamon).	
Prerequisites	A knowledge of the fundamentals of material physics, a knowledge of the electric and physical properties of materials.	

5. Faculty of Technology Management

5.1. Master's Degree Programme in Information Technology

Master's Degree Programme in Information Technology is a two-year programme in English meant for both Finnish and foreign students, who have a Bachelor's degree in Information Technology, Computer Science or equivalent discipline. The programme is worth of 120 ECTS credits and includes coursework of 90 ECTS credits and a Master's thesis of 30 ECTS credits, leading to a Master of Science in Technology degree.

The Aims of the Master's Degree Programme

The aim of the Master's Degree Programme is to prepare the student professionally and academically in those areas of information technology, which are required in positions in industry. Another aim of the Master's Degree Programme is to provide the student with the readiness to undertake post-graduate studies and independent studies in some area of information technology.

Professional Scope of the Master's Degree Programme

The professional scope of the Master's Degree Programme is diverse and rapidly developing. Information systems in industry form a key area in which information processing and telecommunication is combined. Depending on the chosen field of specialisation, the graduate's tasks may include software design and implementation, product design and development as well as specific application of information technology, computational modelling and electronics in monitoring, design and control of production systems. Furthermore, a graduate may also work in the field of research, consulting, sales, and teaching as well as their own business.

Fields of Specialisation

The following alternative fields of specialisation (major subjects) are available at LUT

1. **Intelligent Computing**
2. **Communications Software**
3. **Software Engineering**

1. **Students of Intelligent Computing** get a broad idea of the applications and methods of information processing as well as information processing systems and their design. Advanced studies focus on intelligent information processing and its applications. The graduates can work in:
 - Design, development, and maintenance of information processing systems and software
 - Project planning and management in ICT companies
 - Product development and consulting of intelligent computing
 - Research and teaching in universities and research institutes
2. **Students of Communications Software** gain knowledge of networking by having both technical as well as social point of view. Studies in the major emphasize current and future network technologies that allow communication and networking between humans and/or machines. The highly practical approach to the software aspects of networking links the theoretical knowledge to the real life applications. By completing these studies the students are capable of working in the following fields:
 - Design, implementation, development and maintenance of communication networks and systems
 - Design, implementation and development of communications software and services
 - Product development, consulting and management tasks in the field of communications
 - Research and teaching tasks in universities and research institutes

3. **Students of Software Engineering** will get expertise in software development, its processes, methods and tools. Typical roles for the graduates of this major include software architects, programming experts, software product managers, and systems analysts. Common tasks in the field include
- Design, development, and maintenance of software and information systems
 - Software and systems analysis and design
 - Participation to software development projects in either supplier or customer role
 - Software research and product development
 - Management of software development organizations.

Students starting in Master's Degree Programme are expected to have following skills

Intelligent Computing

Students majoring in Intelligent Computing are expected to have a command of engineering mathematics, especially statistics, matrix calculations and numerical methods. The students are expected to be able to program and justify a choice of data structures and algorithms that solve a given information processing problem. Furthermore, the students must have basic knowledge in theoretical computer science as well as understanding of information technology as a whole including hardware, operating systems, and software levels.

A student in Intelligent Computing must be able to design and implement a program that solves an information processing problem based on a given specification. A student must be able to work both independently and as a part of a team in different kinds of projects. The education is given in English, thus good communication skills in English are necessary both orally and in writing.

Communications Software

Students majoring in Communications Software are expected to master the basic computer science skills from data structures and algorithms up to the practical programming. Student needs to have the basic understanding of protocols as well as communication principles in different network environments. Knowledge of engineering mathematics, and physics helps in understanding of the master's level courses.

A student should be able to design and implement a program that is transferring information between two or more computers, terminals or humans. The graduates can work independently and act as a responsible member of a group. The graduates are able to communicate in English both orally and in written form.

Software Engineering

Students majoring in Software Engineering are expected to have understanding of basic engineering mathematics. The students are expected to have an understanding of the role of software and information systems in modern business. In addition, the students need understanding of programming, basics of software analysis and design methodologies, and project management. Knowledge of operating systems and software development environments will make learning easier.

The student must be able to design and implement a program that uses database through a graphical user interface. The students are expected to be able to work both individually and in project groups. The students are also expected to have a good command of English language.

Complementary Studies

Students with a degree from a Finnish University of Applied Sciences or Polytechnics or equivalent will have to study complementary studies (26 ECTS cr) which are not included in the Master's degree. The extent of these studies depends on the content of the previous degree. Please, see page 92. Further information: International Officer Riitta Salminen, room 4406, phone +358 5 621 2659, +358 40 717 2670, riitta.salminen@lut.fi.

International Master's Degree Programme in Information Technology

The Degree Structure of the Programme

Master of Science 120 ECTS cr

	ECTS cr
General studies	12
Major subject	78
Minor subject	20
Elective studies	10
<i>Total</i>	<i>120</i>

General studies

<i>Obligatory (12 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0300 Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
CT10A9500 Research Methods	M.Sc. (Tech.) 1	1-2	3
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3 M.Sc. (Tech.) 1-2	1, 2, 3, 4	2
	B.Sc. (Econ. & Bus. Adm.) 2-3 M.Sc. (Econ. & Bus. Adm.) 1-2		
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3 M.Sc. (Tech.) 1-2 B.Sc. (Econ. & Bus. Adm.) 3 M.Sc. (Econ. & Bus. Adm.) 1-2	1-2, 3-4	4
FV18A9101 [†] Finnish 1		1, 3	2

[†] Teknisk svenska 2 ECTS is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree

MAJOR: Intelligent Computing

Major Subject in Intelligent Computing 78 ECTS cr

<i>Obligatory Studies (56 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT50A5700 Introduction to Computer Graphics	M.Sc. (Tech.) 1	2	5
CT50A6000 Pattern Recognition	M.Sc. (Tech.) 1	3-4	7
CT50A6100 ⁽¹⁾ Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 1-2	1-2	7
CT50A6200 ⁽¹⁾ Computer and Robot Vision	M.Sc. (Tech.) 1-2	1-2	7
CT50A6400 Compiler Construction	M.Sc. (Tech.) 1	3-4	7
CT10A6000 Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

⁽¹⁾ Exchangeable

<i>Elective Studies (min. 22 cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT10A9100 ECSE International Summer School in Novel Computing	M.Sc. (Tech.) 2	int.	1-2
CT10A9601 Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT50A6100 Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 1-2	1-2	7
CT50A6200 Computer and Robot Vision	M.Sc. (Tech.) 1-2	1-2	7
CT30A7001 Concurrent and Parallel Computing	M.Sc. (Tech.) 1-2	1-2	8

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BK70A0000	Simulation of a Mechatronic Machine	2	M.Sc. (Tech.) 1	3-4	6
BM20A1900	Statistics II	2	M.Sc. (Tech.) 1-	2	3
BM20A2800	Nonlinear Optimization	2	M.Sc. (Tech.) 1-	4	4
BM20A2901	Discrete Optimization	2	M.Sc. (Tech.) 1-	4	5
BM20A4200	Applied Functional Analysis	2	M.Sc. (Tech.) 1-	2-3	5
BM30A0500	Applied Optics	2	M.Sc. (Tech.) 1	2	6

MAJOR: Software Engineering**Major Subject in Software Engineering 78 ECTS cr**

<i>Obligatory Studies (53 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT60A7200	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	5
CT60A7301	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	6
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.) 1	1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1	1-2	5
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

<i>Elective Studies (min 25 cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT10A9100	ECSE International Summer School in Novel Computing	M.Sc. (Tech.) 2	int.	1-2
CT10A9601	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT30A5000	Network Programming	M.Sc. (Tech.) 1	1-2	5
CT30A5800	Communications Software and Architecture	M.Sc. (Tech.) 1	1-2	5
CT30A7400	Distributed Object Programming	M.Sc. (Tech.) 1-	1-2	6
CT30A8001	User-Centric Service Design	M.Sc. (Tech.) 1	3	5
CT30A8901	Service Oriented Communications	M.Sc. (Tech.) 1	2	5
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1-	2	4
CT50A5700	Introduction to Computer Graphics	M.Sc. (Tech.) 1	2	5
CT50A6000	Pattern Recognition	M.Sc. (Tech.) 1	3-4	7
CT50A6400	Compiler Construction	M.Sc. (Tech.) 1	3-4	7

MAJOR: Communications Software**Major Subject in Communications Software 78 ECTS cr**

<i>Obligatory Studies (55 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT30A5000	Network Programming	M.Sc. (Tech.) 1	1-2	5
CT30A5800	Communications Software and Architecture	M.Sc. (Tech.) 1	1-2	5
CT30A5900	Communication Software Laboratory Work	M.Sc. (Tech.) 1	3-4	5
CT30A8001	User-Centric Service Design	M.Sc. (Tech.) 1	3	5
CT30A8901	Service Oriented Communications	M.Sc. (Tech.) 1	2	5
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

<i>Elective Studies (min. 23 cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT10A9100	ECSE International Summer School in Novel Computing	M.Sc. (Tech.) 2	int.	1-2
CT10A9601	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT10A9700	Summer School on Communications Engineering	M.Sc. (Tech.) 2		2
CT30A6801	Local Area Networks, Special Course	M.Sc. (Tech.) 1-	1-3	8

CT30A6900	Peer-to-peer Networking	M.Sc. (Tech.) 1- 3-4 2	5
CT30A7001	Concurrent and Parallel Computing	M.Sc. (Tech.) 1- 1-2 2	8
CT30A7100	Parallel Programming	M.Sc. (Tech.) 1- 3-4 2	5
CT30A7400	Distributed Object Programming	M.Sc. (Tech.) 1- 1-2 2	6
CT30A8300	Wireless Service Engineering	M.Sc. (Tech.) 1- 1-2 2	5
CT30A8800	Secured Communications	M.Sc. (Tech.) 1- 1-2 2	6
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1- 2	4
CT30A9400	Ad hoc and Sensor Networks	M.Sc. (Tech.) 1- 2	5
CT60A7200	Architecture in Systems and Software Development	M.Sc. (Tech.) 1 3-4	5
CT60A7301	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2 1-2	6
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.) 1 1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1 1-2	5

Minor Subject

Minor subject can be selected in Information Technology:

- Intelligent Computing
- Communications Software
- Software Engineering

Minor subject cannot be the same as student's major, and must include the compulsory courses of the selected topic, mentioned under the major. The rest can be selected freely to complete 20 credits.

If choosing one of the following minors, please check the prerequisites! The descriptions can be found in this study guide in the section dedicated to the Master's programmes. Additional information is provided by the study counselling staff of each Master's programme.

- Technomathematics
- Business Administration
- Bio-Energy Technology
- Environmental Energy Technology
- Chemical Engineering
- Advanced Design Methodology
- Packaging Technology
- Technical Physics
- Power Electronics and Electrical Drives
- Industrial Embedded Systems

Elective Studies

Any course given in Lappeenranta University of Technology can be included in elective studies. We recommend courses given by the department of Information Technology and Finnish for Foreigners –language courses.

Total minimum of the degree is 120 ECTS cr.

Complementary Studies

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies (26 ECTS cr) which are not included in the Master's degree.

Obligatory for all

<i>Complementary Studies (26 ECTS cr)</i>		<i>Year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A0500	Matematiikka KoTiB1	M.Sc. (Tech.) 1	3	3
BM20A0700	Matematiikka KoTiB2	M.Sc. (Tech.) 1	3-4	2
BM20A0900	Matematiikka KoTiB3	M.Sc. (Tech.) 1	4	3
BM20A1401	Tilastomatematiikka I	M.Sc. (Tech.) 2	1	3
CT30A2500	TCP/IP -perusteet	M.Sc. (Tech.) 3	1-2	5
CT50A2310	Tietorakenteet ja algoritmit	M.Sc. (Tech.) 2	2	5
CT50A3000	Unix and System Programming	M.Sc. (Tech.) 3	1	5

5.2. CBU Master's Degree Programme in Information and Communications Technology

The CBU Master's Programme in Information and Communications Technology is a two-year joint Master's degree programme which is produced in a concerted way in the network of four Finnish and three Russian universities.

The partners in this international study programme are the following universities:

- St. Petersburg State University
- St. Petersburg State Polytechnic University
- Petrozavodsk State University
- Lappeenranta University of Technology
- University of Kuopio
- University of Joensuu
- University of Helsinki

The objective of the study programme is to offer in each of the seven member universities a M.Sc. programme in ICT, which conforms to agreed CBU guidelines and facilitates cross-border collaboration in the exchange of academic resources, development of joint study modules, visiting lecturers etc.

The curriculum contains compulsory and elective modules, a M.Sc. Thesis. The total volume is 120 ECTS credits. The curriculum contains 60 acts of studies that are produced in cross-border collaboration. At Lappeenranta University of Technology, the alternative major subjects are Intelligent Computing, Communications Software and Software Engineering.

Levels of collaboration of the CBU ICT Master's Programme

- Summer schools and winter schools
- Intensive courses by visiting lecturers
- Student visits to partner institutions
- Internet based courses
- Common projects in cross-border teams
- Jointly supervised M.Sc. projects

Complementary Studies

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies (26 ECTS cr) which are not included in the Master's degree. The extent of these studies depends on the content of the previous degree. Please, see page 92. Further information: International Officer Riitta Salminen, room 4406, phone + 358 5 621 2659, + 358 40 717 2670, riitta.salminen@lut.fi.

Personal Study Plan

At the beginning of their studies, students prepare a personal study plan (PSP). Personal study plans will be approved by the main programme coordinator, Dr. Pekka Jäppinen, who will give further information on how to prepare and update the personal study plan. The workload of the degree of Master of Science is 120 ECTS credits. From the total amount of 120 ECTS cr, 60 ECTS credits must be completed in a Russian CBU-ICT university in cross-border collaboration.

CBU-ICT courses

CBU-ICT courses offered in different partner universities are available on the website
http://www.it.lut.fi/international_studies/cbu/index.html

Degree structure of CBU Master's Degree Programme in Information and Communications Technology

Master of Science 120 ECTS cr

	ECTS cr
General studies	12
Major subject	78
Minor subject	20
Elective studies	10
<i>Total</i>	<i>120</i>

OBLIGATORY FOR ALL MAJORS 12 ECTS cr

General studies

<i>Obligatory (12 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0300 Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
CT10A9500 Research Methods	M.Sc. (Tech.) 1	1-2	3
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3	1, 2,	2
	M.Sc. (Tech.) 1-2	3, 4	
	B.Sc. (Econ. & Bus. Adm.) 2-3		
	M.Sc. (Econ. & Bus. Adm.) 1-2		
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3	1-2,	4
	M.Sc. (Tech.) 1-2	3-4	
	B.Sc. (Econ. & Bus. Adm.) 3		
	M.Sc. (Econ. & Bus. Adm.) 1-2		
FV18A9101 [†] Finnish 1		1, 3	2

[†]) Teknisk svenska 2 ECTS is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree

MAJOR: Intelligent Computing

Major Subject in Intelligent Computing 78 ECTS cr

<i>Obligatory Studies (56 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT50A5700 Introduction to Computer Graphics	M.Sc. (Tech.) 1	2	5
CT50A6000 Pattern Recognition	M.Sc. (Tech.) 1	3-4	7
CT50A6100 ⁽¹⁾ Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 1-	1-2	7
	2		
CT50A6200 ⁽¹⁾ Computer and Robot Vision	M.Sc. (Tech.) 1-	1-2	7
	2		
CT50A6400 Compiler Construction	M.Sc. (Tech.) 1	3-4	7
CT10A6000 Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

⁽¹⁾) Exchangeable

<i>Elective Studies (min. 22 cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT10A9100 ECSE International Summer School in Novel Computing	M.Sc. (Tech.) 2	int.	1-2
CT10A9601 Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT50A6100 Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 1-	1-2	7
	2		

CT50A6200	Computer and Robot Vision	M.Sc. (Tech.) 1- 1-2 2	7
CT30A7001	Concurrent and Parallel Computing	M.Sc. (Tech.) 1- 1-2 2	8
BK70A0000	Simulation of a Mechatronic Machine	M.Sc. (Tech.) 1 3-4	6
BM20A1900	Statistics II	M.Sc. (Tech.) 1- 2 2	3
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1- 4 2	4
BM20A2901	Discrete Optimization	M.Sc. (Tech.) 1- 4 2	5
BM20A4200	Applied Functional Analysis	M.Sc. (Tech.) 1- 2-3 2	5
BM30A0500	Applied Optics	M.Sc. (Tech.) 1 2	6

MAJOR: Software Engineering

Major Subject in Software Engineering 78 ECTS cr

<i>Obligatory Studies (53 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT60A7200	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	5
CT60A7301	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	6
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.) 1	1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1	1-2	5
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

<i>Elective Studies (min 25 cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT10A9100	ECSE International Summer School in Novel Computing	M.Sc. (Tech.) 2	int.	1-2
CT10A9601	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT30A5000	Network Programming	M.Sc. (Tech.) 1	1-2	5
CT30A5800	Communications Software and Architecture	M.Sc. (Tech.) 1	1-2	5
CT30A7400	Distributed Object Programming	M.Sc. (Tech.) 1- 2	1-2	6
CT30A8001	User-Centric Service Design	M.Sc. (Tech.) 1	3	5
CT30A8901	Service Oriented Communications	M.Sc. (Tech.) 1	2	5
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1- 2		4
CT50A5700	Introduction to Computer Graphics	M.Sc. (Tech.) 1	2	5
CT50A6000	Pattern Recognition	M.Sc. (Tech.) 1	3-4	7
CT50A6400	Compiler Construction	M.Sc. (Tech.) 1	3-4	7

MAJOR: Communications Software

Major Subject in Communications Software 78 ECTS cr

<i>Obligatory Studies (55 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT30A5000	Network Programming	M.Sc. (Tech.) 1	1-2	5
CT30A5800	Communications Software and Architecture	M.Sc. (Tech.) 1	1-2	5
CT30A5900	Communication Software Laboratory Work	M.Sc. (Tech.) 1	3-4	5
CT30A8001	User-Centric Service Design	M.Sc. (Tech.) 1	3	5
CT30A8901	Service Oriented Communications	M.Sc. (Tech.) 1	2	5
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

<i>Elective Studies (min. 23 cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT10A9100	ECSE International Summer School in Novel Computing	M.Sc. (Tech.) 2	int.	1-2
CT10A9601	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5

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CT10A9700	Summer School on Communications Engineering	M.Sc. (Tech.) 2	2
CT30A6801	Local Area Networks, Special Course	M.Sc. (Tech.) 1- 1-3 2	8
CT30A6900	Peer-to-peer Networking	M.Sc. (Tech.) 1- 3-4 2	5
CT30A7001	Concurrent and Parallel Computing	M.Sc. (Tech.) 1- 1-2 2	8
CT30A7100	Parallel Programming	M.Sc. (Tech.) 1- 3-4 2	5
CT30A7400	Distributed Object Programming	M.Sc. (Tech.) 1- 1-2 2	6
CT30A8300	Wireless Service Engineering	M.Sc. (Tech.) 1- 1-2 2	5
CT30A8800	Secured Communications	M.Sc. (Tech.) 1- 1-2 2	6
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1- 2	4
CT30A9400	Ad hoc and Sensor Networks	M.Sc. (Tech.) 1- 2	5
CT60A7200	Architecture in Systems and Software Development	M.Sc. (Tech.) 1 3-4	5
CT60A7301	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2 1-2	6
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.) 1 1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1 1-2	5

Master's Thesis 30 ECTS cr

Two examiners will be appointed to supervise the Master's Thesis. The first examiner/supervising professor must be appointed from Lappeenranta University of Technology and the second examiner must be from a Russian CBU-ICT university.

Minor Subject 20 ECTS cr

Obligatory: CT10A9601 Research Methods, Laboratory Project, 1 - 5 ECTS

Student chooses 15 credits lectured at the Russian CBU-ICT partner universities, from the CBU Winter and Summer Schools, visiting lectures and intensive courses.

Elective Studies 10 ECTS cr

Student chooses 10 credits lectured at the Russian CBU-ICT partner universities, from the CBU Winter and Summer Schools, visiting lectures and intensive courses. Minimum of the degree is 120 ECTS cr.

For CBU courses, please see: http://www.it.lut.fi/international_studies/cbu/index.html

5.3. Fenno-Russian Master Degree Programme in Information Technology 2009 – 2010 (FRIT)

FRIT is a double degree programme between LUT and ETU (St.Petersburg State Electrotechnical University). The students will study one year at their home university and then come to LUT for second year to specialize in one of the three offered major subjects. Student is expected to do Master's thesis according to LUT practices. Please, see page 198

Student is also obliged to complete studies at home university and obtain diploma from there.

Degree structure of Fenno-Russian Master Degree Programme in Information Technology (FRIT)

Major 70 cr

MAJOR Intelligent Computing

Major Subject in Intelligent Computing 70 ECTS cr

<i>Obligatory Studies (56 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT50A5700	Introduction to Computer Graphics	M.Sc. (Tech.) 1	2	5
CT50A6000	Pattern Recognition	M.Sc. (Tech.) 1	3-4	7
CT50A6100 ¹⁾	Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 1-	1-2	7
		2		
CT50A6200 ¹⁾	Computer and Robot Vision	M.Sc. (Tech.) 1-	1-2	7
		2		
CT50A6400	Compiler Construction	M.Sc. (Tech.) 1	3-4	7
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

¹⁾ Exchangeable

Elective Studies (14 cr)

CT10A9100	ECSE International Summer School in Novel Computing
CT10A9601	Research Methods, Laboratory Project
CT50A6100	Machine Vision and Digital Image Analysis
CT50A6200	Computer and Robot Vision
CT30A7001	Concurrent and Parallel Computing
BK70A0000	Simulation of a Mechatronic Machine
BM20A1900	Statistics II
BM20A2800	Nonlinear Optimization
BM20A2901	Discrete Optimization
BM20A4200	Applied Functional Analysis
BM30A0500	Applied Optics

MAJOR Software Engineering

Major Subject in Software Engineering 70 ECTS cr

<i>Obligatory Studies (53 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT60A7200	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	5
CT60A7301	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	6
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.) 1	1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1	1-2	5
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

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Elective Studies (17 cr)

CT10A9100	ECSE International Summer School in Novel Computing
CT10A9601	Research Methods, Laboratory Project
CT50A5700	Introduction to Computer Graphics
CT50A6000	Pattern Recognition
CT50A6400	Compiler Construction
CT30A5000	Network Programming
CT30A5800	Communications Software and Architecture
CT30A7400	Distributed Object Programming
CT30A8001	User-Centric Service Design
CT30A8901	Service Oriented Communications
CT30A9300	Code Camp on Communications Engineering

MAJOR Communications Software

Major Subject in Communications Software 70 ECTS cr

<i>Obligatory Studies (55 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT30A5000	Network Programming	M.Sc. (Tech.) 1	1-2	5
CT30A5800	Communications Software and Architecture	M.Sc. (Tech.) 1	1-2	5
CT30A5900	Communication Software Laboratory Work	M.Sc. (Tech.) 1	3-4	5
CT30A8001	User-Centric Service Design	M.Sc. (Tech.) 1	3	5
CT30A8901	Service Oriented Communications	M.Sc. (Tech.) 1	2	5
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

Elective studies (15 cr)

CT10A9100	ECSE International Summer School in Novel Computing
CT10A9601	Research Methods, Laboratory Project
CT10A9700	Summer School on Communications Engineering
CT30A6801	Local Area Networks, Special Course
CT30A6900	Peer-to-peer Networking
CT30A7001	Concurrent and Parallel Computing
CT30A7100	Parallel Programming
CT30A7400	Distributed Object Programming
CT30A8300	Wireless Service Engineering
CT30A8800	Secured Communications
CT30A9300	Code Camp on Communications Engineering
CT30A9400	Ad hoc and Sensor Networks
CT60A7200	Architecture in Systems and Software Development
CT60A7301	Software Quality, Processes, and Organizations
CT60A7400	Fundamentals of Information Systems
CT60A7500	Object-Oriented Programming Techniques

5.4. Courses in English in Information Technology

The Courses Offered in English

	<i>ECTS cr</i>	
CT10A0010	Laboratory Work Course in Information Technology	10 - 30
CT10A6000	Master's Thesis and Seminar	30
CT10A9100	ECSE International Summer School in Novel Computing	1 - 2
CT10A9500	Research Methods	3
CT10A9601	Research Methods, Laboratory Project	1 - 5
CT10A9700	Summer School on Communications Engineering	2
CT30A5000	Network Programming	5
CT30A5800	Communications Software and Architecture	5
CT30A5900	Communication Software Laboratory Work	5
CT30A6801	Local Area Networks, Special Course	8
CT30A6900	Peer-to-peer Networking	5
CT30A7001	Concurrent and Parallel Computing	8
CT30A7100	Parallel Programming	5
CT30A7400	Distributed Object Programming	6
CT30A8001	User-Centric Service Design	5
CT30A8300	Wireless Service Engineering	5
CT30A8800	Secured Communications	6
CT30A8901	Service Oriented Communications	5
CT30A9300	Code Camp on Communications Engineering	4
CT30A9400	Ad hoc and Sensor Networks	5
CT50A5700	Introduction to Computer Graphics	5
CT50A6000	Pattern Recognition	7
CT50A6100	Machine Vision and Digital Image Analysis	7
CT50A6200	Computer and Robot Vision	7
CT50A6400	Compiler Construction	7
CT60A7200	Architecture in Systems and Software Development	5
CT60A7301	Software Quality, Processes, and Organizations	6
CT60A7400	Fundamentals of Information Systems	7
CT60A7500	Object-Oriented Programming Techniques	5

CT10A0010	LABORATORY WORK COURSE IN INFORMATION TECHNOLOGY	10 - 30 ECTS cr
	Laboratory Work Course in Information Technology	
	The course is only intended for foreign visiting students. The students register for the course by contacting the supervisor.	
Teacher(s)	Person in Charge: Head of the Laboratory.	
Aims	To give the student a deeper understanding in Information Technology in a specialized area.	
Content	A specific project which is done in one of the laboratories of the department. The project is planned together with the supervisor and consists mainly of laboratory work, literature work and report writing. The course may contain lectures and seminars.	
Modes of Study	Participation in the work of the research group and the research report.	
Evaluation	0-5 or passed/failed.	
Study materials	Literature related to the project.	

CT10A6000	MASTER'S THESIS AND SEMINAR	30 ECTS cr
	Diplomityö ja seminaari	
Year and Period	M.Sc. (Tech.) 2, Period 1-4	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Heikki Kälviäinen, Professor, D.Sc. (Tech.) Jari Porras and Professor, Ph.D. Kari Smolander	
Aims	A student learns about independent work and scientific writing, related into specific problems in the field of information technology.	
Content	An independent thesis done in the field of information technology, according to the instructions given. In the beginning a student must contact the professor responsible for the major subject of a student: Information Processing, Intelligent Computing (prof. Kälviäinen), Communications Engineering and Communications Software (prof. Porras) and Software Engineering (prof. Smolander). Independent work according to the agreed plan. The starting and finishing point of the thesis vary. A seminar presentation of the thesis should be given in an agreed, specific time before the assessment of the thesis in a faculty council meeting.	
Modes of Study	Master's Thesis and a seminar presentation, maturity exam.	
Evaluation	0 - 5. Master's thesis 100 %.	
Prerequisites	CT10A9500 Research Methods completed and a minimum of 15 ECTS credits of the major studies completed.	
CT10A9100	ECSE INTERNATIONAL SUMMER SCHOOL IN NOVEL COMPUTING	1 - 2 ECTS cr
	ECSE International Summer School in Novel Computing, Itä-Suomen tietotekniikan tutkijakoulun kesäkoulu	
	Intensive course in summer time.	
Year and Period	M.Sc. (Tech.) 2, Period int.	
Teacher(s)	Professor, D.Sc. (Tech.) Heikki Kälviäinen	
Aims	A student actively participates in the summer school. A student learns the scientific basics, research activities and application areas of one of the selected topics of the summer school.	
Content	Content changes every year. Lectures will be held by visiting international lecturers.	
Modes of Study	Lectures and/or exercises, 40 h, and/or practical assignments.	
Evaluation	Passed/failed. Participation and practical assignments.	
Study materials	http://www.it.lut.fi/opiskelu/ecse/courses.html .	
CT10A9500	RESEARCH METHODS	3 ECTS cr
	Research Methods, Tutkimusmenetelmät	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Lecturer, D.Sc. (Tech.) Arto Kaarna	
Aims	To familiarize the student with the research work and the basic methods in research. To prepare the student to the research approach of her/his master's thesis.	
Content	Research work, philosophy of research. Research process. Designing research, research questions and hypothesis. Qualitative and quantitative research methods. Reporting scientific work.	
Modes of Study	Lectures 14 h, 1st period. Practical assignments, 2nd period. Exam.	
Evaluation	0 - 5. Exam 60 %, practical assignments 40 %.	
Study materials	Creswell, J.W.: Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, SAGE, 2003. Hirsjärvi, S., Remes, P., Sajavaara, P.: Tutki ja kirjoita, 10. painos, Tammi, 2004.	

Prerequisites	Research reports. B.Sc. studies finished.	
CT10A9601	RESEARCH METHODS, LABORATORY PROJECT	1 - 5 ECTS cr
	Research Methods, Laboratory Project, Tutkimusmenetelmät, laboratoriprojekti	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professor, D.Sc. (Tech.) Heikki Kälviäinen, Professor, D.Sc. (Tech.) Jari Porras, Professor, Ph.D. Kari Smolander	
Aims	To execute a well-defined research task in Communications Software, Machine Vision and Pattern Recognition, or Software Engineering Laboratory.	
Content	Research work in the topic defined by the laboratory. When starting the course contact one of the professors according to your major subject: tietojenkäsittelytekniikka, informaatiotekniikka, älykäs laskenta, Information Processing, Intelligent Computing (Prof. Kälviäinen), tietoliikennetekniikka, tietoliikenneohjelmistot, digitaalinen viestintätekniikka, Communications Engineering, Communications Software (Prof. Jari Porras), and ohjelmistotekniikka, Software Engineering (Prof. Smolander). Reporting and a seminar presentation of the work implemented.	
Modes of Study	Participation in the work of the research group, 1st - 4th period.	
Evaluation	Passed/failed. Research report and seminar presentation.	
Study materials	Literature related to the research topic, agreed with the supervisor of the work.	
Prerequisites	CT10A9500 Research Methods, excellent grades in studies.	
CT10A9700	SUMMER SCHOOL ON COMMUNICATIONS ENGINEERING	2 ECTS cr
	Summer School on Communications Engineering, Tietoliikennetekniikan kesäkoulu	
	Intensive course in summer time.	
Year and Period	M.Sc. (Tech.) 2	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Jari Porras	
Aims	Student actively participates all three days of summer school event. Student learns the basics and the current status of the selected topic of the summer school. Student gains practical experience by participating code camp.	
Content	Content changes every year. Basics, current status and research activities of the selected field. Practical working on a code camp. Lectures will be held by visiting lecturers and researchers. Suitable also for postgraduate studies.	
Modes of Study	Lectures 18 h, practical assignment 22 h, written report about event.	
Evaluation	Passed/failed, practical assignment 100%.	
Study materials	http://www.it.lut.fi/ssotc/	
Prerequisites	Basic programming skills. Recommended CT10A9500 Research Methods.	
CT30A5000	NETWORK PROGRAMMING	5 ECTS cr
	Network Programming, Tietoliikenneohjelmointi	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Researcher/Teacher, Docent, D.Sc. (Tech.) Jouni Ikonen	
Aims	Understand problematics of networked applications. Ability to read and implement protocols described in standards.	
Content	Use of Internet Protocol in communications programming. Server models. Socket interface usage and event-based programming. Synchronous and asynchronous operations, layers, parallelism and security in network programming. Realization of protocols according standards.	

Modes of Study	Lectures 14 h, exercises 10 h, 1st period. Exercises 8 h, 2nd period. 6 practical assignments. Final assignment. Assignments can not be combined from multiple years.
Evaluation	0 - 5. Practical assignments 70 %, final assignment 30 %. Exercises.
Study materials	Stevens, W.R.: Unix Network Programming, The Sockets Networking API, Vol. 1, 3rd Ed., Prentice Hall, 2004. Internetworking with TCP/IP Vol. 3: Client-Server Programming and Application, Linux/POSIX Socket Version (Comer, D.E., Stevens, D.), 2000.
Prerequisites	C-language. Basic unix workstation usage skills. CT30A2500 TCP/IP - perusteet. Recommended CT50A3000 Unix and System Programming.

CT30A5800	COMMUNICATIONS SOFTWARE AND ARCHITECTURE	5 ECTS cr
	Communications Software and Architecture, Tietoliikenneohjelmistot	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Pekka Jäppinen	
Aims	To give a student the basic knowledge about software, design and development.	
Content	Message Sequence Chart, Finite State Machines, Petri Nets, Specification and Description Language, Abstract Syntax Notation 1, Protocol Design, Implementation and Verification, Protocol Layering Concept, Client/Server Paradigm, Protocol Standards.	
Modes of Study	Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, exercises 14 h, project assignment, 2nd period. Exam.	
Evaluation	0 - 5. Exam 70 %, project 30 %.	
Study materials	Lecture hand-outs. Popovic, M.: Communication Protocol Engineering, CRC Press, 2006.	
Prerequisites	Recommended CT60A4001 Ohjelmistotuotanto, CT30A2001 Tietoliikennetekniikan perusteet .	

CT30A5900	COMMUNICATION SOFTWARE LABORATORY WORK	5 ECTS cr
	Communication Software Laboratory Work, Protokollaohjelmointi	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Assistant, Petri Heinilä	
Aims	To give a student the basic knowledge about a practical definition and realisation of communications and ability to apply this knowledge for the carrying out of software communications.	
Content	The course includes practical laboratory assignments that deal with usage, design and implementation of protocol software. Protocol software design, implementation, and testing using C/C++/Java programming languages in a development environment.	
Modes of Study	Laboratory demonstrations 14 h, 3rd period. Laboratory demonstrations 12 h, project work presentation 8 h, project work, 4th period.	
Evaluation	100 % Project passed/failed.	
Study materials	Lecture hand-outs.	
Prerequisites	CT30A5800 Communications Software and Architecture. Recommended CT50A2310 Tietorakenteet ja algoritmit, CT50A3000 Unix and System Programming, CT30A2001 Tietoliikennetekniikan perusteet .	

CT30A6801	LOCAL AREA NETWORKS, SPECIAL COURSE 8 ECTS cr
	<p>Local Area Networks, Special Course, Lähiverkot -erikoistyökurssi</p> <p>The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2010 - 2011.</p>
Year and Period	M.Sc. (Tech.) 1-2, Period 1-3
Teacher(s)	Researcher/Teacher, Docent, D.Sc. (Tech.) Jouni Ikonen
Aims	Recognize local area networking technologies. Understand how basic network services operate and be able to implement services independently for common software components. Understand requirements and relationships of network services and common problematics. Can act as member and leader of a large project.
Content	Local area network standards, components, application interfaces and practice. Study of used communication protocols (e.g. IP and some of upper layer protocols). Network services in Linux environment (e.g. DHCP, firewalls and web-server). Course has practical exercises and a large scale project work.
Modes of Study	Lectures 4 h, exercises 5 h, 1st period. Lectures 4 h, seminars 10 h, exercises 21 h, 2nd period. Seminars 10 h, exercises 17 h, 3rd period.
Evaluation	Laboratory works, seminar works and project work, 1st, 2nd and 3rd period. 0 - 5. Project work 40 %, laboratory- and seminar works 60 %
Study materials	Stallings, W.: Local and Metropolitan area networks, Prentice-Hall, 1997. Stevens, W.R.: TCP/IP Illustrated, Vol. 1: The Protocols, Addison-Wesley, 1994.
Prerequisites	Stevens, W.R.: UNIX Network Programming, Addison-Wesley, 2004. Recommended CT50A3000 Unix and System Programming, CT30A5000 Network Programming, CT30A5800 Communications Software and Architecture.
CT30A6900	PEER-TO-PEER NETWORKING 5 ECTS cr
	<p>Peer-to-peer Networking, Vertaisverkot</p> <p>The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2009 - 2010.</p>
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras
Aims	This course aims to provide the student with the fundamental principles of peer-to-peer networking, its main challenges and possible solutions.
Content	Principles of peer-to-peer networking, Peer-to-peer systems and applications, Overlay networks, Challenges, Security, fairness and trust concerns, Practical P2P development with a programming language. Suitable also for postgraduate studies.
Modes of Study	Lectures 21 h, Exercises 14 h, 3rd period. Project work 4th period. Exam.
Evaluation	0 - 5. Exam, 50% Project work 50 %.
Study materials	Barkai, D. 2001 Peer-To-Peer Computing: Technologies for Sharing and Collaborating on the Net. Intel Press. Steinmetz, R. and Wehrle, K. 2005 Peer-To-Peer Systems and Applications (Lecture Notes in Computer Science). Springer-Verlag See more: http://mediaserver.it.lut.fi/kurssiwiki/index.php/Peer-to-Peer_Networking
Prerequisites	CT30A5000 Network Programming

CT30A7001	CONCURRENT AND PARALLEL COMPUTING 8 ECTS cr
	<p>Concurrent and Parallel Computing, Rinnakkaislaskennan perusteet</p> <p>The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2010 - 2011.</p>
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras
Aims	Student understands the concept of concurrency and the meaning, concepts as well as applications of parallel and distributed computing. He/she also knows different architectures and their usage. Student can implement simple parallel programs and utilize parallel methods on their own work.
Content	Emerging need for parallel computing, parallel architectures and their classification, performance meters and scalability as well as a general view of programming in a parallel environment. Suitable also for postgraduate studies.
Modes of Study	Lectures 30 h, exercises 12 h, 1st period.
Evaluation	Seminars 21 h, exercises 14 h, practical assignments, 2nd period. Exam. 0 - 5. Exam 50 %, presentation 25 %, practical assignments 25 %.
Study materials	Grama, A. et al.: Introduction to Parallel Computing, Addison-Wesley, 2003. Roscoe, A.W.: The theory and practice of concurrency, Pearson Education, 1998.
Prerequisites	Recommended CT50A2601 Käyttöjärjestelmät, CT50A3000 Unix and System Programming.
CT30A7100	PARALLEL PROGRAMMING 5 ECTS cr
	<p>Parallel Programming, Rinnakkaisohjelmoinnin perusteet</p> <p>The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2009 - 2010.</p>
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4
Teacher(s)	Assistant, M.Sc. (Tech.) Jani Peusaari
Aims	Student knows the difference between sequential and parallel programming and can implement advanced programs using multiple programming models. Student knows how to utilize essential features, e.g. optimized communication and load balancing, of parallel computing. He/she can also use specific tools that aid in debugging and analyzing parallel programs.
Content	Principles of parallel programming, differences between processes and threads. Usage of a cluster of workstations as a parallel programming environment. Programming using distributed libraries (PVM, MPI) and shared memory libraries (POSIX threads, OpenMP.) Debugging and analysis of parallel programs.
Modes of Study	Lectures 14 h, exercises 14 h, project work, 3rd period. Exercises 12 h, project presentations 8 h, project work, 4th period.
Evaluation	0 - 5. Project work 100 %.
Study materials	Foster, I.: Designing and building parallel programs, Addison-Wesley, 1995. Andrews, G.: Foundations of Multithreaded, Parallel and Distributed Programming, Addison-Wesley, 2000. Pacheco, P.: Parallel programming with MPI, Morgan Kaufmann Publishers, 1997. Butenhof, D.: Programming with POSIX threads, Addison-Wesley, 1997. Chandra R. et al.: Parallel Programming in OpenMP, Morgan Kaufman Publ., 2001.
Prerequisites	Lecture hand-outs. Recommended CT50A2601 Käyttöjärjestelmät, CT50A3000 Unix and System Programming, CT30A7001 Concurrent and Parallel Computing.

CT30A7400	DISTRIBUTED OBJECT PROGRAMMING	6 ECTS cr
	Distributed Object Programming, Hajautettu objektiohjelmointi	
	The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	To introduce the student to the object-oriented design and open distributed processing based digital communication architectures and design methodology.	
Content	Object-oriented systems, application level distribution and architectures in communication, remote procedure calls, service and interface descriptions, application data representation, object discovery services, related design patterns. Some (eg. CORBA, WebServices) distributed programming environment implementation is used to express concepts and practices of the distributed system.	
Modes of Study	Lectures 14 h, exercises 14 h, homeworks, 1st period. Lectures 14 h, exercises 14 h, homeworks, project work, 2nd period. Exam.	
Evaluation	0 - 5. Exam 50 %, project work 36 %, homeworks 14 %.	
Study materials	Lecture notes.	
Prerequisites	Recommended CT60A2410 Olio-ohjelmointi, CT60A4001 Ohjelmistotuotanto, CT30A2001 Tietoliikennetekniikan perusteet , CT30A5000 Network Programming.	
CT30A8001	USER-CENTRIC SERVICE DESIGN	5 ECTS cr
	User-Centric Service Design, Käyttäjäkeskeiset tietoliikennepalvelut	
Year and Period	M.Sc. (Tech.) 1, Period 3	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Kari Heikkinen	
Aims	After the course the student is expected to be able - to understand the terminology, fundamentals and characteristics of User-Centric Service design - to understand its role, main methods and processes and effect on designing communication engineering applications and services taking into account both user and technology requirements - to demonstrate the learning with both written assignments and with designed, implemented and presented practical assignment.	
Content	User-Centric Service Design terminology, fundamentals and characteristics. The role, methods, processes and the effect of the UCD in applying it to communication engineering application design, implementation and evaluation. User and Technology requirements based on selected area of interest in communication engineering. Evaluation of UCD designs and prototypes of different fidelities. Flash programming as prototyping technology. Suitable also for postgraduate studies.	
Modes of Study	Lectures 21 h, exercises 14 h, home assignments (4), exam, 3. period.	
Evaluation	0 - 5. Home assignments 40%, continuous evaluation 40%, exam 20%.	
Study materials	Lecture and Web-material.	
Prerequisites	Recommended CT10A9500 Research Methods.	
CT30A8300	WIRELESS SERVICE ENGINEERING	5 ECTS cr
	Wireless Service Engineering, Langattomien palveluiden tekniikka	
	The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2010 - 2011.	

Year and Period	M.Sc. (Tech.) 1-2, Period 1-2
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Pekka Jäppinen
Aims	To understand the challenges that wireless communication technologies and mobile devices provide to service development. To learn methods to improve the use of wireless services.
Content	Wireless service types: fixed services, mobile Internet services, ad hoc services, mobile p2p, ubiquitous services, environment services. The service perspective to mobile devices and wireless network technologies. Service discovery methods. Service enhancing technologies: adaptation and personalisation, context awareness, location. Suitable also for postgraduate studies.
Modes of Study	Lectures 21 h, demonstrations 14 h, exercises 14 h, practical assignment, 1st period.
Evaluation	Practical assignment, 2nd period. Exam.
Study materials	0 - 5. Exam 50 %, practical assignments 50 %.
Prerequisites	Will be announced on lectures. CT30A2600 Langaton tietoliikenne, CT30A5000 Network Programming. Recommended CT30A5800 Communications Software and Architecture.

CT30A8800	SECURED COMMUNICATIONS	6 ECTS cr
	Secured Communications, Suojatut tietoyhteydet	
	The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2009 - 2010.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Pekka Jäppinen	
Aims	To learn how to secure the communication channel between communicating devices.	
Content	Security risks against communication channel. Creation of secure communication channel. Cryptographic methods: Symmetric and asymmetric encryption algorithms, hash functions, key exchange methods. Authentication methods. Digital signatures. Suitable also for postgraduate studies.	
Modes of Study	Lectures 14 h, exercises 14 h, 1st period.	
Evaluation	Lectures 8 h, seminars 20 h, practical assignment, 2nd period. Exam.	
Study materials	0 - 5. Exam 40 %, seminars 30 %, practical assignment 30 %. Trappe W., Washington L.C.: Introduction to Cryptography with Coding Theory. Schneier, B.: Applied Cryptography, Wiley, 1996. Kerttula, E.: Tietoverkkojen tietoturva, 2. painos, Edita, 2000. Lecture hand-outs.	
Prerequisites	CT30A3500 Tietoturvan perusteet. Recommended CT30A2500 TCP/IP -perusteet, CT30A5000 Network Programming.	

CT30A8901	SERVICE ORIENTED COMMUNICATIONS	5 ECTS cr
	Service Oriented Communications, Palvelukeskeinen kommunikaatio	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	Service- and Web oriented architecture terminology, theories, techniques, standards and infrastructures are introduced and studied in the light of service development. The course will give fundamentals for service development in web following the fundamentals of service-oriented computing.	
Content	Service oriented architecture: concepts and technology, Service orientation Service Design and Design principles. Suitable also for postgraduate studies.	
Modes of Study	Lectures 21 h, exercises 14 h, practical assignment, 2. periodi. Exam.	

Evaluation	0 - 5. Exam 60%, practical assignment 40%.	
Study materials	Erl, T.: Service-Oriented Architecture: Concepts, Technology and Design, Prentice-Hall, 2005. Erl, T.: SOA: Principles of service design, Prentice-Hall, 2008.	
CT30A9300	CODE CAMP ON COMMUNICATIONS ENGINEERING	4 ECTS cr
	Code Camp on Communications Engineering, Tietoliikennetekniikan code camp	
	The course is arranged intensively 1-2 times /year.	
Year and Period	M.Sc. (Tech.) 1-2	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Jari Porras	
Aims	Code camp is a short term practically oriented course where students work together on their projects based on the selected topic of the course. After the course students are expected to be able <ul style="list-style-type: none"> • to use the achieved knowledge on the topic in their work • to implement other projects with the technology. 	
Content	Topic varies each time.	
Modes of Study	Lectures and demonstrations, project work, presentation 52h.	
Evaluation	0 – 5. project work 60%, reports 30%, presentation 10%.	
Study materials	To be announced in beginning of the course based on the selected topic.	
Prerequisites	Based on the topic. To be announced with the final course description.	
CT30A9400	AD HOC AND SENSOR NETWORKS	5 ECTS cr
	Ad hoc and Sensor Networks, Dynaamiset sensoriverkot	
Year and Period	M.Sc. (Tech.) 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	This course aims to provide the student with the fundamental principles of wireless ad hoc and sensor networking, their main challenges and possible solutions.	
Content	Wireless ad hoc networks: link layer issues and medium access control, ad hoc routing, wireless sensor networks: architectures, broadcasting, multicasting, geocasting, routing and energy efficiency.	
Modes of Study	Book based course.	
Evaluation	0 – 5. Exam 100%.	
Study materials	Cordeiro C. and Agrawal D.: Ad hoc & Sensor Networks, World Scientific Publishing, 2006, OR Murthy C. and Manoj B.: Ad hoc wireless networks, Prentice-Hall, 2004.	
Prerequisites	Recommended: CT30A2600 Langaton tietoliikenne	
CT50A5700	INTRODUCTION TO COMPUTER GRAPHICS	5 ECTS cr
	Introduction to Computer Graphics, Tietokonegrafiikan perusteet	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	Lecturer, D.Sc. (Tech.) Arto Kaarna	
Aims	Basic knowledge in computer graphics and in use of graphics libraries and programs.	
Content	Examples and applications of computer graphics. Introduction to two-dimensional graphics. Principals of graphics hardware. Raster graphics. Introduction to modelling of three-dimensional objects. Algorithms in three-dimensional graphics. Open GL graphics library.	
Modes of Study	Lectures 21 h, exercises 14 h and two practical assignments, 2nd period. Exam.	
Evaluation	0 - 5. Exam 100 %. Exercises and practical assignments.	

Study materials	Hearn, D., Baker, M.P.: Computer Graphics with OpenGL, Prentice-Hall, 3rd Edition, 2004. Foley, J.D., van Dam, A., Feiner, S.K., Hughes, J.H.: Computer Graphics: Principles and Practice. 2nd edition in C. Addison-Wesley, 1997.
Prerequisites	CT60A0210 Käytännön ohjelmointi.

CT50A6000	PATTERN RECOGNITION	7 ECTS cr
	Pattern Recognition, Hahmontunnistus	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Ville Kyrki	
Aims	The course has three basic aims: firstly to understand the field of pattern recognition in general, secondly to get familiar with pattern recognition techniques, and thirdly to obtain the ability to apply techniques to applications.	
Content	Introduction. Bayesian inference and statistical pattern recognition. Discriminants and neural pattern recognition. Decision tree, syntactic and structural approaches. Context-dependent classification. Reinforcement learning. Unsupervised learning. Suitable also for postgraduate studies.	
Modes of Study	Lectures 21 h, exercises 14 h, 3rd period.	
Evaluation	Lectures 21 h, exercises 14 h, 4th period. Practical assignment. Exam.	
Study materials	0-5. Exam 50 %, exercises 50 %. Lecture notes. Duda, R.O., Hart, P.E., Stork, D.G.: Pattern Classification, Wiley, 2001. Theodoridis, S., Koutroumbas, K.: Pattern Recognition, Academic Press, 2003.	
Prerequisites	Matematiikka A and B, CT60A0210 Käytännön ohjelmointi, BM20A1401 Tilastomatematiikka I. Recommended BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta, or equivalent knowledge.	

CT50A6100	MACHINE VISION AND DIGITAL IMAGE ANALYSIS	7 ECTS cr
	Machine Vision and Digital Image Analysis, Konenäkö ja digitaalinen kuva-analyysi	
	The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2009 - 2010.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Heikki Kälviäinen	
Aims	To introduce students to the field of machine vision and image analysis and its application areas.	
Content	Digital image processing: digital image, image transforms, image enhancement, image compression. Image analysis: segmentation, representation and description, recognition and interpretation. Hardware, software and applications. Suitable also for postgraduate studies.	
Modes of Study	Lectures and seminars 21 h, exercises 12 h, 1st period. Lectures and seminars 21 h, exercises 14 h, practical assignment, 2nd period. Exam.	
Evaluation	0 - 5. Exam 50 %, exercises 50 %. Seminar presentation, which gives extra points to an exam. Acting as an opponent. Practical assignment.	
Study materials	Gonzales, R.C., Woods, R.E.: Digital image processing, Prentice-Hall, 2002. Jain, A.K.: Fundamentals of digital image processing, Prentice-Hall, 1989.	
Prerequisites	Recommended CT50A5700 Introduction to Computer Graphics, CT50A6000 Pattern Recognition, BM30A0500 Applied Optics.	

CT50A6200	COMPUTER AND ROBOT VISION	7 ECTS cr
	Computer and Robot Vision, Tietokone- ja robottinäkö	
	The course will be lectured every second year only. The course will be lectured every second year, next time during the academic year 2010 - 2011.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Ville Kyrki	
Aims	To understand the theoretical basis and motivation to use geometric and dynamic computer vision, to know the applications of vision in robotics, and to know the basics of using the methods in practice.	
Content	Vision in Robotics. Imaging models and calibration. Coordinate frames and geometrical primitives. Single and multi-view geometry. Pose estimation. Dynamic vision and tracking. Visual servoing. Structure from motion and SLAM. Suitable also for postgraduate studies.	
Modes of Study	Lectures 21 h, exercises 14 h, 1st period.	
Evaluation	Lectures 21 h, exercises 14 h, 2nd period. Practical assignment. Exam.	
Study materials	0 - 5. Exam 50 %, exercises 50 %. Practical assignment. Lecture notes. Trucco, E., Verri, A.: Introductory Techniques for 3-D Computer Vision, Prentice-Hall, 1998.	
Prerequisites	Matematiikka A and B, CT60A0200 Ohjelmoinnin perusteet. Recommended BM20A1401 Tilastomatematiikka I, BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta or equivalent knowledge.	
CT50A6400	COMPILER CONSTRUCTION	7 ECTS cr
	Compiler Construction, Kääntäjätekniiikat	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Lecturer, D.Sc. (Tech.) Arto Kaarna	
Aims	To familiarize the student with theory of compilers and languages for selected formal languages.	
Content	Languages and grammars. Regular languages and lexical analysis. Introduction to parsing. Tools for compiler construction. Syntax directed translation, attribute grammars, intermediate representation. Machine independent optimization.	
Modes of Study	Lectures 21 h, exercises 14 h, 3rd period.	
Evaluation	Lectures 21 h, exercises 14 h and a terminal project, 4th period. Exam.	
Study materials	0 - 5. Exam 100 %. Exercises and project. Aho, A.V., Lam, M.S., Sethi, R., Ullman, J.D.: Compilers: Principles, Techniques, and Tools, Second edition, Addison Wesley, 2007.	
Prerequisites	CT50A2000 Tietojenkäsittelyn perusteet I, CT50A2310 Tietorakenteet ja algoritmit.	
CT60A7200	ARCHITECTURE IN SYSTEMS AND SOFTWARE DEVELOPMENT	5 ECTS cr
	Architecture in Systems and Software Development, Arkkitehtuuri järjestelmien ja ohjelmistojen kehityksessä	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, Ph.D. Kari Smolander	
Aims	The student understands the role of architecture in the development of software and information systems and has the basic skills of how to design and describe architecture.	
Content	The role of architecture in development. Software architecture. Systems architecture. Enterprise architecture. Application integration. Architecture	

Modes of Study	design. Architecture documentation. Architectural styles and patterns. Suitable also for postgraduate studies. Lectures, lecture exercises and presentations at lectures 21 h, 3rd period. Lectures, lecture exercises and presentations at lectures 21 h, 4th period. Practical assignment and presentation. Exam.
Evaluation	0 - 5. Exam 50 %, practical assignment 30 %, presentation 20 %.
Study materials	Lecture notes based on the following books: Bass, L., Clements, P., Kazman, R.: Software Architecture in Practice, 2nd Ed., Addison-Wesley, 2003. Linthicum, D.S.: Next Generation Application Integration: From Simple Information to Web Services, Addison-Wesley, 2003. Ross, J.W., Weill, P., Robertson, D.: Enterprise Architecture As Strategy: Creating a Foundation for Business Execution, Harvard Business School Press, 2006.
Prerequisites	CT60A4101 Ohjelmistotuotannon menetelmät or equivalent.

CT60A7301	SOFTWARE QUALITY, PROCESSES, AND ORGANIZATIONS	6 ECTS cr
	Software Quality, Processes, and Organizations, Ohjelmistojen laatu, prosessit ja organisaatiot	
	Recommended for CBU-students. The amount of participants may be limited.	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Senior Assistant, D.Sc. (Tech.) Uolevi Nikula	
Aims	After the course student can explain quality, process, and organization related issues in software development and how such issues can be solved based on literature and on personal experiences from the course project. Students can also synthesize the knowledge acquired during the course and develop quality and process documentation for a software company.	
Content	Software development issues. Software development processes, their history, maturity, and state of the practice. Quality in software development, approaches to assure and improve quality. Processes and organizations. Suitable also for postgraduate studies.	
Modes of Study	Lectures 14 h and exercises 14 hours, 1st period. Lectures 14 h and exercises 14 hours, 2nd period. Compulsory assignments given in the lectures. Exam.	
Evaluation	0 - 5. Exam 60 %, compulsory assignments 40%.	
Study materials	Robillard, Kruchten, and d'Astous: Software Engineering Process with the UPEDU, Addison-Wesley, 2002.	
Prerequisites	CT60A4101 Ohjelmistotuotannon menetelmät or equivalent.	

CT60A7400	FUNDAMENTALS OF INFORMATION SYSTEMS	7 ECTS cr
	Tietojärjestelmien perusteet	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Lecturer, D.Sc. (Tech.) Erja Mustonen-Ollila	
Aims	In order to complete the course the student should be able to: Demonstrate a sound grasp of the history of information systems (IS) in business, including an IS development. Describe the organisational uses of information systems to improve overall quality. Demonstrate the concepts for the specification and design or the re-engineering of organisationally related systems of limited scope using information technology. Explain what is meant by an information system development process, and what performance measurement implies. Show how information technology can be used to design, facilitate, and communicate organisational goals and objectives of information systems. Describe career paths in information systems. Present and discuss the	

Content	<p>professional and ethical responsibilities of the IS practitioner. Recognise the role and use of IS in technology and in business systems and operations. Identify and describe organisational structure and business processes within these structures. Demonstrate an understanding of the process in systems design and development. Discuss, and describe fundamental concepts of IS theory and IS research methods and their importance to practitioners. Discuss the relationship of IS planning to organisational planning.</p> <p>Examination the nature of the information systems discipline and key areas of professional interest and expertise. Introduction of the main topic areas in the study of information systems (IS) from both a theoretical and practical perspective covering also the IS research perspective. To discuss the role of information systems in society. To explain the operations of information systems, and the role of technology, business, and social environment within systems, and how information systems are developed, acquired or outsourced. To explain the use of information systems in business. To discuss and analyse the changing role of the information systems in the achievement of business objectives such as communication, collaboration, performance enhancement etc. Getting familiar with the basic concepts and methods in information systems research. Suitable also for postgraduate studies.</p>
Modes of Study	<p>Lectures 21 h, exercises 14 h, 1st period. Lectures 21 h, exercises 14 h, 2nd period. Practical assignment. Exam.</p>
Evaluation	0 - 5. Exam 50 %, practical assignment 50 %.
Study materials	<p>Stair, R., and Reynolds, G. (2006) The Fundamentals of Information Systems. 3rd edition. ISBN 13: 978-0-619-21560-6. ISBN 10: 0-619-21560-7. Järvinen, P. (2004) On Research methods. Opinpaja, Tampere. Järvinen, P. (2004) Tutkimustyön metodeista. Opinpaja, Tampere.</p>
Prerequisites	CT60A4001 Ohjelmistotuotanto

CT60A7500	OBJECT-ORIENTED PROGRAMMING TECHNIQUES	5 ECTS cr
	Object-Oriented Programming Techniques, Olio-ohjelmoinnin menetelmät	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Kari Smolander	
Aims	The student understands advanced concepts and techniques of object-oriented programming, especially design patterns, and can apply these techniques in solving practical programming tasks.	
Content	Introduction to Java. Java run-time object model. Composition, inheritance, and interfaces. Reusability. Collections and containers. Reflection. Serialization. Design patterns and their applications. Design rules and principles.	
Modes of Study	Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, exercises 14 h, practical assignment, 2nd period. Exam.	
Evaluation	0 - 5. Exam 60 %, exercises and practical assignment 40 %.	
Study materials	<p>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).</p>	
Prerequisites	Olio-ohjelmointi (Object-Oriented Programming) or equivalent.	

6. School of Business

6.1. Master's Degree Program (CBU) in Business and Administration International Technology and Innovation Management (MITIM)

The Master's Degree Program in International Technology and Innovation Management is the result of cooperation between two universities in Finland and Russia: the Graduate School of Management (GSOM) of St. Petersburg State University and Lappeenranta University of Technology's School of Business.

The Master's degree program titled as "International Technology and Innovation Management", takes two years, corresponds to 120 ECTS credits and leads to the degrees of Master of Science in Economics and Business Administration at LUT, School of Business and Master of Management at GSOM. Thus students admitted into the program receive a degree certificate from both universities. Three semesters include obligatory lectures and exercises, as well as a summer internship and essay and elective courses. The fourth semester is devoted to the Master's thesis. The language of tuition in the program is English. In the autumn of 2009 students will study at GSOM in St. Petersburg.

Master of Science in Economics and Business Administration

The Degree Structure

General Studies	6	ECTS cr
Major Subject	66	ECTS cr
Minor Subject	30	ECTS cr
Elective Studies	18	ECTS cr
<i>Credits</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

Major Subject (66 ECTS cr)

International Technology and Innovation Management (66 ECTS cr)

<i>All courses are obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AC60A0000 Cross-Cultural Management and Corporate Social Responsibility in the Information Age	M.Sc. (Econ. & Bus. Adm.)	1 1-3	6
AC60A0050 Knowledge Management as a Theory and Practice	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
AC60A0200 Supply and Innovation Management	M.Sc. (Econ. & Bus. Adm.)	1 3-4	6
AC60A0250 International High Technology Marketing	M.Sc. (Econ. & Bus. Adm.)	1 4	6
AC60A0500 Economics of Innovation	M.Sc. (Econ. & Bus. Adm.)	1 4	3
AC60A5200 Intellectual Capital Management	M.Sc. (Econ. & Bus. Adm.)	1 1-2	3
CS30A6100 Technology Management	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
AC60A9000 Research Seminar for Master's Thesis	M.Sc. (Econ. & Bus. Adm.)	2 1-4	30

Minor Subject (30 ECTS cr)

Business Administration in CBU (30 ECTS cr)

<i>All courses are obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AB30A0550 International Financial Management	M.Sc. (Econ. & Bus. Adm.)	1 3	6
AC60A0150 Strategic Management of Growth	M.Sc. (Econ. & Bus. Adm.)	1 3	6
AC60A5000 Managerial Economics	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
AC60A5100 [†] Consulting Project	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
AC60A0550 [†] Consulting Project at LUT	M.Sc. (Econ. & Bus. Adm.)	1 3-4	6
MITIM-HAR Internship and Interim Report	M.Sc. (Econ. & Bus. Adm.)	2	6

[†] Please note that only one of the courses can be included in the Master's degree

General Studies (6 ECTS cr)

	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AC60A0450 Quantitative Methods for Business Research	M.Sc. (Econ. & Bus. Adm.) 1	3-4	3
AC60A5150 Qualitative Methods for Business Research	M.Sc. (Econ. & Bus. Adm.) 1	1-2	3

Elective Studies (18 ECTS cr)

Min. 18 ECTS credits should be selected from GSOM or LUT School of Business or from other co-operation universities

<i>Electives from GSOM</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
European Union – Russia Relations	M.Sc. 2		5
Business-Government Relations	M.Sc. 2		5
Economics of Information Technology and Telecommunications Network	M.Sc. 2		5
Emerging Markets	M.Sc. 2		5
Business in Arab World	M.Sc. 2		5
Relationship Marketing and Network Approach in Marketing	M.Sc. 2		5
Marketing Communications	M.Sc. 2		5
Knowledge Engineering	M.Sc. 2		5
International Retail Management	M.Sc. 2		5
Business Process Modelling	M.Sc. 2		5
Knowledge Management Technologies	M.Sc. 2		5
E-Business and Web-Technologies	M.Sc. 2		5
Enterprise Information Systems	M.Sc. 2		5

<i>Electives from LUT School of Business</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
AB30A0600 Empirical Research in Accounting and Finance	M.Sc. (Econ. & Bus. Adm.) 2	3-4	7
AC40A0101 Cross-Cultural Marketing Strategies	M.Sc. (Econ. & Bus. Adm.) 2	2	6
AC40A0150 Integrated Marketing Communication	M.Sc. (Econ. & Bus. Adm.) 2	4	5
AC40A0201 Internationalization of the Firm	M.Sc. (Econ. & Bus. Adm.) 2	2	6
AC40A0651 International Business Strategies	M.Sc. (Econ. & Bus. Adm.) 2	3-4	6
AC50AJ200 Collaborative Innovation and Innovativeness	M.Sc. (Econ. & Bus. Adm.) 2		7
AC60A0350 Multivariate and Econometric Analysis Methods	M.Sc. (Econ. & Bus. Adm.) 2	1-2	6
AC60A0400 International Accounting and Analysis	M.Sc. (Econ. & Bus. Adm.) 2	1-2	6
CS10A0600 Doing Business in Transitional Economies	M.Sc. (Econ. & Bus. Adm.) 2	3-4	7

Additional Information

Master's Thesis

The Master's thesis is a demanding research project carried out in the field of the student's major subject.

Language Studies

Students of LUT School of Business will have to take complementary language studies of a minimum of 9 ECTS credits of one language. These studies are not included in the Master's degree, but are an addition to it.

Contact Information

Program Coordinator:

Professor, Ph. D. Minna Martikainen (minna.martikainen@lut.fi), program content

International Officer:

Essi Reponen (room 7385.1, essi.reponen@lut.fi), practical issues

Program web pages: <http://www.lut.fi/kati/lb/>

The Courses Offered in English

		<i>ECTS cr</i>
AB30A0550	International Financial Management	6
AB30A0600	Empirical Research in Accounting and Finance	7
AC40A0101	Cross-Cultural Marketing Strategies	6
AC40A0150	Integrated Marketing Communication	5
AC40A0201	Internationalization of the Firm	6
AC40A0651	International Business Strategies	6
AC50AJ200	Collaborative Innovation and Innovativeness	7
AC60A0000	Cross-Cultural Management and Corporate Social Responsibility in the Information Age	6
AC60A0050	Knowledge Management as a Theory and Practice	6
AC60A0150	Strategic Management of Growth	6
AC60A0200	Supply and Innovation Management	6
AC60A0250	International High Technology Marketing	6
AC60A0350	Multivariate and Econometric Analysis Methods	6
AC60A0400	International Accounting and Analysis	6
AC60A0450	Quantitative Methods for Business Research	3
AC60A0500	Economics of Innovation	3
AC60A0550	Consulting Project at LUT	6
AC60A5000	Managerial Economics	6
AC60A5050	International Economics and Trade	6
AC60A5100	Consulting Project	6
AC60A5150	Qualitative Methods for Business Research	3
AC60A5200	Intellectual Capital Management	3
AC60A9000	Research Seminar for Master's Thesis	30
CS10A0600	Doing Business in Transitional Economies	7
CS30A6100	Technology Management	6
MITIM-HAR	Internship and Interim Report	6

AB30A0550	INTERNATIONAL FINANCIAL MANAGEMENT	6 ECTS cr
	International Financial Management	
	Language of teaching is English	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen	
Aims	The aim of the course is to provide an analytic framework for understanding how cross-border financing, valuation, risk management, and investment decisions are influenced by a variety of factors including exchange rates, legal rules, international tax considerations and country risks. The course provides the understanding how firms can create, measure, and sustain value across borders.	
Content	The course consists of the four different areas in international financial management. The part including currencies and asset prices concentrates in the mechanisms of exchange rates. The area of multinational financial decision making considers several of the central financial decisions multinational firms must make. The part of cross-border valuation and financing considers how the valuation and financing decisions must be modified in a cross-border setting. Institutions and Finance part includes the topics of investors' behavior and risk management.	
Modes of Study	Lectures 24 h, 3rd period. Course work (Assignment on a topic of mutual agreement, which can be written individually or in groups of up to three members). Exam. Blackboard in use.	
Evaluation	Graded 0–5 based 80% on an exam and 20% on course work.	

Study materials	1. Madura, J., International Financial Management, 8th edition, or later version 2. Handouts in the class and all additional material required by the lecturer.
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor's thesis)
AB30A0600	EMPIRICAL RESEARCH IN ACCOUNTING AND 7 ECTS cr FINANCE
	Empirical Research in Accounting and Finance
	Language of teaching is English
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4
Teacher(s)	Docent, D.Sc. (Econ. & Bus. Adm.) Jussi Nikkinen Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen
Aims	The course has the following two objectives. First, the course provides an overview of recent relevant research issues in accounting and finance, thereby extending and deepening students' knowledge in the area of accounting and finance. Second, the course is intended to prepare students to do empirical research in accounting and finance.
Content	Relevant research issues related to financial reporting; corporate governance; agency relationships; managerial incentive plans; market efficiency; information content of asset prices; accounting, capital markets and financial institutions; international financial markets.
Modes of Study	Lectures/seminar 21 h. Over the course of the term there will be two to three assignments, such as an article analysis. The aim of these assignments is to get students to understand the principles of deductive empirical research. The main course requirement is to write a term paper from the area of accounting or finance containing at minimum a detailed well-developed research proposal. Blackboard in use.
Evaluation	Graded 0–5 on the basis of the term paper.
Study materials	There is no textbook. Issues covered in class will be based on research papers and articles.
Prerequisites	Compulsory B.Sc. courses in Accounting or in Finance (except Bachelor's thesis). AC40A0010 Tilastollisen analyysin perusteet (Basic Course in Statistical Analysis Method) and AB40A0100 Monimuuttujamenetelmät (Multivariate Analysis Methods or Ka6710100 Quantitative Research Methods I)
AC40A0101	CROSS-CULTURAL MARKETING STRATEGIES 6 ECTS cr
	Cross-Cultural Marketing Strategies
	All instruction will be in English. The number of attending students may have to be limited if the number of students exceeds 70.
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 2
Teacher(s)	Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	To familiarize the students with the factors in the cultural environment of business and to help them understand how these factors affect international marketing strategies.
Content	Central concepts in understanding culture and its role in business: dimensions and categorizations of culture, sense of time and space, communication and negotiation styles. Understanding the effects of globalization on culture. Using cultural concepts to analyze how firms adapt their marketing strategies to foreign cultures.
Modes of Study	21 hours of lectures with integrated exercises, assignments, written exam.
Evaluation	0-5, written exam 60%, assignments 40%.
Study materials	1. Broweys & Price (2008): Understanding Cross-Cultural Management, Prentice Hall. 2. Selected chapters of Usunier (2000): Marketing Across Cultures, Prentice

Prerequisites	Hall. AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet
AC40A0150	INTEGRATED MARKETING COMMUNICATION 5 ECTS cr
	Integrated Marketing Communication All instruction will be in English.
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 4
Teacher(s)	Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	To familiarize the student with the concept and process of marketing communication. To give the students basic skills in the design, implementation and management of communication as part of the marketing process.
Content	The role of marketing communication in the marketing strategy of an enterprise. The concept and implementation of integrated marketing communication. The design, implementation and management of advertising, sales promotion and public relations. The introduction of electronic and print media, media choice, the creative process and execution of a promotion campaign. The services in campaign planning, the advertising business and the advertiser-agency relationship. Legal and ethical issues in advertising. The course focuses especially on mass communication because there is a separate course available in personal selling and sales management.
Modes of Study	28 hours of lectures, 14 hours of exercises, groupwork and an individual ad analysis report, 4th period.
Evaluation	Written exam.
Study materials	0-5, written exam 50%, individual ad analysis 30%, groupwork 20%. 1. Percy, Rossiter & Elliott (2001): Strategic Advertising Management, Oxford University Press. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet, CS10A0000 Markkinoinnin peruskurssi or Ka6720000 Markkinoinnin ja hankintatoimen perusteet
AC40A0201	INTERNATIONALIZATION OF THE FIRM 6 ECTS cr
	Internationalization of the Firm All instruction will be in English.
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 2
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo
Aims	To familiarize the students with the characteristics of the international market environment and theories of internationalization. To provide strategic views on international market selection and market entry.
Content	Internationalization theories: e.g. the Uppsala model. Network Model and Born Globals. The fundamental management decisions connected with the internationalization processes: (1) Whether to internationalize, (2) Deciding which markets to enter, (3) Deciding how to enter the foreign market, (4) Designing the global marketing programme and (5) implementing and coordinating the global marketing programme.
Modes of Study	21 hours of lectures and 14 hours of practical exercises.
Evaluation	0-5 Active class participation. Exercises: oral and written project reports (30% of final grade). A written final examination (70% of final grade).
Study materials	1. Hollensen, S.: Global Marketing – A Decision-oriented approach, 2004. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet. AC40A0050 Vienti- ja tuontitoiminta

is recommended.

AC40A0651	INTERNATIONAL BUSINESS STRATEGIES	6 ECTS cr
	International Business Strategies	
	The number of students attending the course may have to be limited based on pre-exam if the number of students exceeds 80. In registration priority is given to LUT School of Business' master's students and foreign exchange students with earlier knowledge of international business. All instruction will be in English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 3-4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen	
Aims	The aim of the course is to familiarize the students with strategic planning for international business in general and the management and execution of international business strategies within the context of multinational corporations in particular. To help the students to develop an understanding of various international or global strategies and their advantages and disadvantages. The assignment aims to expose the students to actual management challenges in an international context.	
Content	International business planning. International and global business strategies. Strategic tools for analyzing the internal and external environment, for example resource and product positions. Organization of resources and capabilities within a multinational corporation. Implementation of an international business strategy.	
Modes of Study	14 h of interactive lectures, 3rd period. 14 h of interactive lectures, 4th period. Group assignment/project work.	
Evaluation	Exam. 0-5. Active class participation. Assignment: oral and written project work, 80%. Exam (has to be passed), 20%.	
Study materials	Course books: Lasserre, P. (2007). Global Strategic Management 2nd Edition. Palgrave. Peng, M. W. (2006). Global Strategy. Thomson South-West. Assigned reading.	
Prerequisites	Basic understanding of international business.	
AC50AJ200	COLLABORATIVE INNOVATION AND INNOVATIVENESS	7 ECTS cr
	Collaborative Innovation and Innovativeness	
	The course will be organized next time in the academic year 2010-2011	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Kirsimarja Blomqvist Professor, D.Sc. (Econ. & Bus. Adm.) Aino Kianto Visiting lecturers	
Aims	The aim of the course is to provide understanding of the various perspectives through which innovation as a collaborative social process produces value for the organization, and how that has been approached in research literature.	
Content	The course examines continuous innovation in organizations as a knowledge-based phenomenon. The course focuses on characteristics, antecedents and evaluation of continuous innovation, and how continuous innovation is produced through collaboration among diverse parties.	

Modes of Study	The course consists of several seminars focusing on specific aspects of collaborative innovation and innovativeness. Students are required to write and present a conference paper based on the course topic.
AC60A0000	CROSS-CULTURAL MANAGEMENT AND CORPORATE SOCIAL RESPONSIBILITY IN THE INFORMATION AGE 6 ECTS cr
	Cross-Cultural Management and Corporate Social Responsibility in the Information Age Only for the students of the Master's Degree Program (CBU) in Business and Administration.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-3
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Janne Tienari (lectures at LUT) Associate Professor, Dr. Yuri E. Blagov (lectures at GSOM)
Aims	The objective of the course is to present students with a theoretically and practically grounded understanding of how multinational firms operate. The course pays particular attention to questions related to managing and organizing a cross-cultural workforce. Course themes also include presentation skills, ethics and social responsibility, image building, and the use of management consultants in international business.
Content	Session (1) Introductions, overview and organization of course work. Working across borders: presentation skills. How multinational firms function. Instructions for teamwork assignment 1. Session (2) Ethics and social responsibility in global business. Teamwork assignment presentations 1. Managing the cross-cultural firm: Image building. Instructions for teamwork assignment 2. Session (3) Ethical and responsible decision-making. Teamwork assignment presentations 2. Managing the cross-cultural firm: When cultures meet. Instructions for reading assignment. Instructions for case assignment. Session (4) Reading assignment seminar. Managing the cross-cultural firm: Using consultants. Session (5) Managing the cross-cultural firm: Focus on Russia and Finland. Session (6) Case assignment presentations. Course summary and preparation for the exam.
Modes of Study	Exam. Lectures 6 X 3 hours. Teamwork assignments.
Evaluation	Exam.
Study materials	0–5; exam 50% and assignments 50% of course grade.
Prerequisites	Available in the first course session. Basic knowledge of management and organizations.
AC60A0050	KNOWLEDGE MANAGEMENT AS A THEORY AND PRACTICE 6 ECTS cr
	Knowledge Management as a Theory and Practice Only for students of the Master's Degree Program (CBU) in Business and Administration. The course will be lectured at GSOM.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Kirsimarja Blomqvist Professor, D.Sc. (Econ. & Bus. Adm.) Aino Pöyhönen Assistant Professor, Dr. Tatiana Andreeva Person in Charge: Tatiana Andreeva
Aims	In modern times, both managers and management theorists are increasingly challenged by the changing circumstances and contexts where the competitive

	<p>advantage of firms greatly depends on their ability to create and use knowledge.</p> <p>The aim of the course is to provide students with the understanding of knowledge as an organizational phenomenon and source of competitive advantages for contemporary organizations and to introduce them to key issues of managing knowledge in an organization. The course covers current conceptual frameworks in the field of knowledge management, including notions of knowledge, knowledge economy, the knowledge organization and the knowledge worker, and problems of knowledge creation, sharing and measurement (intellectual capital). Discussing these issues, the course aims to answer the key question: how the company should be organized and managed to be competitive in this knowledge-intensive era.</p> <p>Part I. Introduction to knowledge management (10 h).</p> <p>Topic 1. Introduction. Basic definitions and concepts (4 h).</p> <p>The role of knowledge in organizations and society. Knowledge economy, knowledge society, knowledge organizations. Data, information, knowledge and wisdom. Tacit and explicit knowledge. Personal and organizational, internal and external knowledge. Various attributes of knowledge. Controversies and myths about knowledge management.</p> <p>Topic 2. Knowledge management as a scientific discipline (6 h) (visiting lecturers).</p> <p>Evolution of KM as a scientific discipline. Theoretical roots and generations of KM. Paradigms and perspectives of KM. Emerging future topics in KM. Knowledge-based view of the firm, its underlying assumptions and implications for management. The role of knowledge and knowledge-based interaction in a firm's competitiveness.</p> <p>Part II. Managing knowledge in organizations: key challenges (24 h).</p> <p>Topic 3. Key knowledge-related processes: key concepts and key problems (8 h).</p> <p>Knowledge creation: stages and tools. SECI model. Improvization as a process of knowledge creation. Knowledge sharing: key barriers and solutions. Knowledge hoarding and motivation for knowledge sharing. Organizational learning and a learning organization. External knowledge acquisition and absorptive capacity.</p> <p>Topic 4. The human factor in KM (6 h).</p> <p>Knowledge workers: a new type of employee or just a prestigious title? Specific issues of managing knowledge workers: attraction, motivation, development, retention. Managing knowledge teams. Communities of practice.</p> <p>Topic 5. Organizational infrastructure for KM (6 h).</p> <p>Creating a knowledge organization: key tasks. New requirements for organizational leaders. Influence of the organizational structure, communications and culture on knowledge processes. Best practices and failures around the world. Knowledge management and strategy.</p> <p>Topic 6. Cross-cultural issues in KM (4 h).</p> <p>Cultural influences on key knowledge-related processes. Revising the SECI model from a cross-cultural point of view. KM in MNCs.</p> <p>Part III. Finale. Current KM problems in organizations and future research questions (10 h) (visiting lecturers).</p> <p>Student group project presentations of knowledge management practices in different companies: problem analysis and development of recommendations.</p> <p>Future research questions and course review.</p>
Content	
Modes of Study	<p>Lectures 36 h.</p> <p>Student project 50 h.</p> <p>Student project presentations 8 h.</p> <p>Independent work (reading course material) 60 h.</p> <p>Exam 3 h.</p>
Evaluation	<p>Students' work for the course will be assessed on 2 key aspects: group research paper and knowledge of the course topics (exam).</p> <p>The group project will be dedicated to the analysis of knowledge management practices in a particular company. Details of the group project assignment will be provided at the beginning of the course.</p>

Study materials	<p>The exam is a written test. It is based on all course issues and material. The final assessment is composed as follows:</p> <ul style="list-style-type: none"> • Final exam – 60% • Student group project – 40% <p>Compulsory reading:</p> <ul style="list-style-type: none"> • A selection of up-to-date articles will be provided at the beginning of the course. <p>Basic textbooks (these books are recommended solely as additional basic reading).</p> <ul style="list-style-type: none"> • Davenport, T. and Prusak, L. Working Knowledge: How Corporations Manage What They Know. Boston: Harvard Business School Press. 1998. • Nonaka, I. and Takeuchi, H. The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford: Oxford University Press. 1995.
Prerequisites	None.

AC60A0150	STRATEGIC MANAGEMENT OF GROWTH	6 ECTS cr
	Strategic Management of Growth	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Timo Pihkala Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Timo Pihkala	
Aims	The objective of the course is to provide students with up-to-date insights into business growth strategies and their implications on management and on research. The course deals with the concept of strategy, the models of business growth, the relationship between growth and strategy, the barriers to growth, traditional routes of growth, external growth models and business growth analysis.	
Content	Objectives of firms. The connection between business growth and strategy. Dimension and directions of growth and development. External growth.	
Modes of Study	Lectures and assignments 20 h. Exam.	
Evaluation	0-5. Assignment 50%, exam 50%.	
Study materials	Articles, lecture notes and material announced during lectures.	
Prerequisites	Introduction to Management	

AC60A0200	SUPPLY AND INNOVATION MANAGEMENT	6 ECTS cr
	Supply and Innovation Management	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Veli-Matti Virolainen Professor, D.Sc. (Tech.) Jukka Hallikas Dr. Konstantin V. Krotov (GSOM)	
Aims	The objective of the course is to address the methods and frameworks for analyzing changing business models as a part of enterprise-wide supply and value networks. The aim is to deepen the understanding about the strategic role of supply management. It is designed to meet the requirements for using purchasing and supply management as a source of competitive advantage in organizations.	
Content	The course examines the structure and role of innovation management in complex supply/demand business systems. The course covers the following topics: inter-firm learning and change management, the principles of systems	

Modes of Study Evaluation Study materials	thinking, methods for assessing customer value, mapping of business processes and value streams, systematic innovation of business models, the role of technology in supply networks, and risk management of supply/demand processes. Purchasing and supply strategy as a part of a business strategy and issues of external resource management are covered during the course. 28 h of lectures and exercises in the 3-4 periods. Exam 0-5. Approved exercise reports. 1. Hughes, J., Ralf, M., and Michels, B.: Transform Your Supply Chain. International Thomson Business Press, 240 p., 1998. 2. Cox, A.: Business Success. Earlsgate Press, 325 p., 1997. 3. Journal articles. Assigned reading (will be announced later).	
AC60A0250	INTERNATIONAL HIGH TECHNOLOGY MARKETING	6 ECTS cr
Year and Period Teacher(s) Aims Content Modes of Study Evaluation Study materials	International High Technology Marketing Only for the students of the Master's Degree Program (CBU) in Business and Administration. M.Sc. (Econ. & Bus. Adm.) 1, Period 4 Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen Associate Professor, Dr. Sergey P. Kouchtch Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo Visiting lecturers The aim of the course is to provide students an understanding of high-technology marketing challenges and opportunities. To help the participants to understand the advantages and limitations of traditional marketing thinking and tools in emergent, international high technology markets. After the course, students will have skills to analyze the market environment and plan and organize marketing activities in international high-technology markets. The course will include lectures, guest lectures, presentations, assignments and discussions on selected topics and practical problems. Current insights into challenges and opportunities in international high technology markets. The concepts of technology and "high-tech". Innovations and new products in high-tech markets. Industry structure, industry changes and marketing implications. Marketing research in international high-tech markets. Partnering. Entry timing. Strategic planning and marketing strategies in international high technology markets. Organizing marketing activities in international high-tech markets. 28 h of interactive lectures Active participation. Independent and class assignments, project work. Exam. 0-5. Active class participation and assignments, including project work (40% of the final grade). Written exam (60% of the final grade). All assignments have to be passed. 1. Mohr, Jakki, Sanjit Sengupta, and Stanley Slater. Marketing of High-Technology Products and Innovations. Second Edition (2005) or third edition (2009). Pearson Prentice Hall. 2. Assigned reading.	

AC60A0350	MULTIVARIATE AND ECONOMETRIC ANALYSIS METHODS	6 ECTS cr
	Multivariate and Econometric Analysis Methods	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Kaisu Puumalainen, Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Heli Virta	
Aims	The course will familiarize students with basic multivariate and econometric methods of analysis. Empirical cross-sectional, time series and panel data from various fields of economics and business is used, and the students should be able to conduct both descriptive, predictive and explanatory research, and present the results of the analyses.	
Content	Multiple linear regression analysis, factor analysis, cluster analysis, general linear models. Special issues in regression modeling: dummy variables, non-linear models, simultaneous equations, probit/logit-models, limited dependent variables, instrumental variables. SAS software will be used.	
Modes of Study	Lectures 21 h, exercises 21 h, 1st–2nd period. Seminars 8 h, 2nd period. Written seminar report and presentation.	
Evaluation	0-5 based on seminar work, written report 75%, presentation 25%.	
Study materials	Hair, Joseph Jr. et al.: Multivariate data analysis. Prentice Hall, 1998. Hill, R. Carter – Griffiths, William E. – Judge, George G.: Undergraduate Econometrics, 2nd edition. 2001.	
Prerequisites	Basic courses in statistics and economics.	
AC60A0400	INTERNATIONAL ACCOUNTING AND ANALYSIS	6 ECTS cr
	International Accounting and Analysis	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Sanna Tilli	
Aims	The objective of the course is to enrich students' understanding of international accounting and financial reporting. Particular emphasis is on comparative and international aspects of accounting together with financial analysis. The objective of the course is also to instruct students how to interpret financial information and assess the performance and prospects of the firm and how to use financial statement information to prepare a valuation.	
Content	The course provides students knowledge of the main international differences in financial accounting, harmonization, international financial analysis, financial statement analysis, valuation, assessment of accounting quality and the link between accounting and finance.	
Modes of Study	Lectures 28 h. Term paper, exam. Blackboard in use.	
Evaluation	Graded 0-5 on the basis of the exam (80%) and the term paper (20%).	
Study materials	1. Nobes and Parker: Comparative International Accounting, 2006 2. Penman: Financial Statement Analysis and Security Valuation, 2007	

AC60A0450	QUANTITATIVE METHODS FOR BUSINESS RESEARCH	3 ECTS cr
	Quantitative Methods for Business Research	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration. Course will be lectured at LUT	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Kaisu Puumalainen	
Aims	The objective of the course is to give the students an understanding of quantitative research process and methodology. The course provides the students with skills in the practical research design, analysis and reporting issues. After the course the students should be able to:	
	<ul style="list-style-type: none"> - understand the role of quantitative empirical research - write a research proposal - use databases to search for existing publications and empirical data - critically evaluate the research design and results of quantitative studies - design an empirical study - evaluate the validity and reliability - understand the applicability of the most typical quantitative analysis methods - use SAS software for simple statistical analyses 	
Content	1) What is scientific research? Basic issues of the philosophy of science, research process, requirements for a Master's thesis 2) Using databases: finding research publications, introduction of secondary data sources 3) Research design: sampling, collecting secondary data, designing surveys (soliciting responses, analyzing non-response bias, survey data collection methods, questionnaire design, pre-testing, typical problems with survey data), reliability and validity, observational and experimental research designs 5) Analysis methods (descriptive, crosstabs, correlation, t-test, ANOVA, linear regression) and SAS software 6) Reporting: Research proposal, literature review, reporting the methodology, presenting the results	
Modes of Study	Participation in lectures, 18 hours Evaluation of a research proposal and a Master's thesis Data collection and analysis exercises, 6 hours	
Evaluation	Written exam based on the lectures and course material Evaluation of research proposal and master's thesis accepted vs. not accepted Report of data collection and analysis exercise is graded from 0-5 and forms 25% of final grade Written exam is graded from 0-5 and forms 75% of the final grade. The maximum points in the exam will be 50, and 25 points (50%) are required for passing the exam.	
Study materials	Cooper, D.R. & Schindler, P.S. (2001) Business Research Methods. New York: McGraw-Hill. Chapters 1-18, 20	
Prerequisites	None	
AC60A0500	ECONOMICS OF INNOVATION	3 ECTS cr
	Economics of Innovation	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Kalevi Kyläheiko Professor, D.Sc. (Econ. & Bus. Adm.) Ari Jantunen Docent, Ph.D. Hannes Toivanen	

Aims	To familiarize students with basic concepts of the economics of innovation and economics-based strategy research, and provide an overview of theoretical perspectives on the economics of information goods, knowledge and innovation.
Content	Knowledge-based economy, technological development and productivity, theoretical foundations and contemporary challenges of science and technology policies, innovation, competition and industry structure, competitiveness of firms, profiting from innovation, pricing information goods, network externalities, economics of intellectual property rights, economics of innovation.
Modes of Study Evaluation	Lectures 20 h, 4. period. Term paper. Exam. 0-5
Study materials	Assigned literature to be announced later.

AC60A0550	CONSULTING PROJECT AT LUT	6 ECTS cr
	Consulting Project at LUT	
	The course will be lectured at LUT.	
Year and Period Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4 Academic Advisors -LUT faculty members Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen	
Aims	To develop a hands-on consulting experience. To analyze a real life business problem, to do and apply relevant research, to find a sound solution to the problem and professionally present the results both to the Client Company and to a Commission at LUT. To develop team-working, project management, business communication and consulting skills.	
Content	Teams of 4-6 Master students with Academic Advisors (LUT faculty) act as consulting teams to tackle real-life business problems stated by leading international companies in or in Finland. The course (business communication, presentations, the final report etc) are in English. The client companies are located by LUT School of Business.	
Modes of Study	Academic Advisors: 20 contact hours. Workload: 136 hours (meetings with Client Company, group meetings, research, preparation of the midterm report, the final report and 2 presentations).	
Evaluation	20% Academic Advisor 30% Client Company 50% LUT Commission All members of a team get the same final grade (unless there is a written complaint of a free-rider from the group). The final grade is given on a competitive basis among the groups.	
Study materials	Depends on the topic and Academic Advisor's recommendations LUT Project Work Guidelines	

AC60A5000	MANAGERIAL ECONOMICS	6 ECTS cr
	Managerial Economics	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration. The course will be lectured at GSOM.	
Year and Period Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2 Senior Lecturer Ekaterina V. Sokolova Person in Charge: Senior Lecturer Ekaterina V. Sokolova	
Aims	The course aims to introduce a practical approach to economics theory. It attempts to bridge the gap between purely analytical problems that intrigue many economic theorists and the day-to-day decisions that managers face. It includes analysis of different tools and approaches for managerial policy-	

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Content	making. The course covers the economic analysis for such concepts as cost, demand, profit, and competition. Students will also examine some theoretical points of industrial innovation and technological change, oligopoly and strategic behaviour, and international competitiveness.
Modes of Study	Lectures, discussions, presentations, case studies. Lectures 34 h. Seminars 17 h.
Evaluation	Home and in-class assignments – 30% Mid-term exam – 10% Final exam – 60%
Study materials	Nick Wilkinson: Managerial Economics, Cambridge University Press, 2005. E. Mansfield: Managerial Economics; W.W. Norton & Company, 1990.
Prerequisites	Introductory microeconomics

AC60A5050	INTERNATIONAL ECONOMICS AND TRADE	6 ECTS cr
	International Economics and Trade	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration. The course will be lectured at GSOM.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Associate Professor, Dr. Vasily K. Dermanov Person in Charge: Associate Professor, Dr. Vasily K. Dermanov	
Aims	The aim of the course is to provide students with advanced knowledge of the main issues in international economics and trade. They study how countries are integrated in world markets and how their economy is affected by international transactions. Students develop an understanding of the principle frameworks of international trade theory that will help them to analyze a number of real world issues.	
Content	Every week students attend a lecture (2 hours) and take part in seminar work (2 hours). The course consists of 16 topics covering the issues of comparative advantages, specific factors and income distribution, resources and trade, trade models, economies of scale and imperfect competition, international factor movements, instruments of trade policy, trade policy in developing countries, industrial policy in advanced countries, national income accounting and the balance of payments, exchange rates and the foreign exchange market, the global capital market. The focus is on the international exchange of goods, services and factors of production. Some important aspects of international finance (e.g. exchange rate determination, international debt) are also discussed.	
Modes of Study	The course is conducted on a lecture-discussion basis. Lectures are supplemented by reading. Students should also read recommended articles and use Internet resources. The seminar format combines case exercises and discussion on readings. Lectures 34 h. Seminars 17 h.	
Evaluation	Obligatory course in the Master's Degree Program (CBU) in Business and Administration. Mid-term examination, November. Final written exam, January The mid-term examination test covers the main topics studied during the first part of the course. The final written exam is based on all course issues and materials.	
Study materials	Thomas Pugel, International Economics, 12th ed., 2004	

AC60A5100	CONSULTING PROJECT	6 ECTS cr
	Consulting Project	
	Only for the students of the Master's Degree Programmes in Management. The course will be lectured at GSOM.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Academic Advisors – GSOM faculty members	
Aims	Person in Charge: Elena Kornyshkova, Master Programs Executive Director To develop a hands-on consulting experience. To analyze a real life business problem, to do and apply relevant research, to find a sound solution to the problem and professionally present the results both to the Client Company and to a Commission at GSOM	
Content	To develop team-working, project management, business communication and consulting skills. Teams of 4-6 Master students with Academic Advisors (GSOM faculty) act as consulting teams to tackle real-life business problems stated by leading international companies in St. Petersburg. The course (business communication, presentations, the final report etc) are in English.	
Modes of Study	The client companies are located by the GSOM Career Center. Academic Advisors: 20 contact hours. Workload: 136 hours (meetings with Client Company, group meetings, research, preparation of the midterm report, the final report and 2 presentations).	
Evaluation	20% Academic Advisor 30% Client Company 50% GSOM Commission All members of a team get the same final grade (unless there is a written complaint of a free-rider from the group). The final grade is given on a competitive basis among the groups.	
Study materials	Depends on the topic and Academic Advisor's recommendations GSOM Consulting Project Guidelines	
AC60A5150	QUALITATIVE METHODS FOR BUSINESS RESEARCH	3 ECTS cr
	Qualitative Methods for Business Research	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration. Course will be lectured at GSOM.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Senior Lecturer, PhD Ludmila Bogolomova	
Aims	The objective of the course is to give the students an understanding of research process and methodology, especially in the context of international business research. The course provides the students with skills in the practical research design, analysis and reporting issues, especially in the context of cross-cultural studies. After the course the students should be able to: - Students will gain practical experience in study design and the application of the major research methods. - By the end of this course, participants should be able to: appreciate the importance of qualitative research methods in the B2B and B2C sectors; - Decide when a research topic requires qualitative research methods and select the most appropriate qualitative format to address the research question; - Begin to develop skills required to conduct interviews, - Facilitate focus groups and undertake ethnographic research including observation; - Begin to understand how to analyse qualitative data; start to understand how to employ qualitative methods alongside other methods in marketing research	

Content	<ol style="list-style-type: none"> 1. Overview of qualitative research methods 2. Sampling structure, recruitment 3. Interviewing: devising schedules, interview techniques, topic-guide, process of interviewing. 4. Focus groups: different approaches, techniques, moderating. 5. Ethnography and observational methods 6. Analyzing data: constant comparison, developing descriptive accounts, theorizing 7. Using qualitative research methods for business: base for strategic decisions. 8. Planning qualitative research: Working up attendees' research ideas 9. Reporting: Research proposal, conducting a literature review, reporting the methodology, presenting the results 10. Creating of qualitative report: differences between business oriented and academic report.
Modes of Study	<p>Participation in lectures, 30 hours Case study, group presentation. Written exam based on the lectures and course books</p>
Evaluation	<p>Written exam is graded from 0-5. The maximum points in the exam will be 60 and 40 points are required for passing the exam.</p>
Study materials	<ol style="list-style-type: none"> 1. Qualitative marketing research] : a cultural approach / Johanna Moisander and Anu Valtonen. - London [u.a.] : SAGE, 2006. - XI, 227 p. : p. - (Introducing qualitative methods). - ISBN 1-4129-0381-5 : 1185.88 p. 2. Handbook of qualitative research methods in marketing / edited by Russell W. Belk. 3. Reader composed by Bogomolova L.
Prerequisites	None

AC60A5200	INTELLECTUAL CAPITAL MANAGEMENT	3 ECTS cr
	Intellectual Capital Management	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration. The Course will be lectured at GSOM	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Professor Vasily Dermanov	
Aims	<p>The essential goal of this course is to provide the students with adequate knowledge of how to use all resources of the firm, including its traditional economic and intellectual capital resources. The course considers basic principles of value creation, as well as link between resources, intellectual resources included, and strategy.</p> <p>According to the course goal formulated above, the main course tasks are:</p> <ul style="list-style-type: none"> - To familiarize the students with the structure of resources used in value creation processes; - To introduce to the students the basic instruments of intellectual capital analysis; - To introduce the links between the firm's strategy and resources. 	
Content	<p>Knowledge economy. Intellectual capital and its structure. Traditional economic and intellectual capital resources. Tangible and intangible capital. Transformation of resources and methods of value creation. The resource transformation. Resources transformation management. Value creation logic. Value chain. Value shop. Value network. Intellectual capital and strategy. Strategy theories and intellectual capital.</p>	
Modes of Study	Lectures 30 h	
Evaluation	Exam.	
Study materials	Assigned literature to be announced later.	

AC60A9000	RESEARCH SEMINAR FOR MASTER'S THESIS 30 ECTS cr
	Research Seminar for Master's Thesis
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-4
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen, Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo
Aims	The aim of the research seminar is to guide students thru out the process to prepare the master thesis. The research seminar consists of three different parts. 1) Introductory lectures 4 hours 2) Research seminar I: to present the research plan 2) Research seminar II: to present almost final version of the master thesis. The seminar is giving the basis knowledge, how to conduct a research project.
Content	To present the analysis of the research subject in written format. To write research plan. To conduct the analysis of the theoretical basis of the research area, conduct the research and write draft of the master thesis. To present both research plan and nearly final version of the master thesis. Final examination after the master thesis is finished.
Evaluation	The analysis of the research topic needs to be accepted by the supervising professor. Both research seminars I and II has to be conducted and accepted. Master thesis and final examination has to be accepted. Master thesis graded 0 – 5 (improbatur – laudatur)
CS10A0600	DOING BUSINESS IN TRANSITIONAL ECONOMIES 7 ECTS cr
	Doing Business in Transitional Economies, Liiketoiminta siirtymätalouksissa
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Teacher(s)	Professor, Ph.D. Tauno Tiusanen Assistant, M.Sc. (Tech.) Anna Karhu
Aims	Students are able to evaluate the emerging markets and choose the right modes of operations in TEs.
Content	Must know: Country profiles of European transitional economies (TEs). The communist legacy in TEs. Macro-economic framework of the transitional process. Post-communist region in the global economy. Risks and opportunities in the TE markets. Investment climate and foreign direct investment in the TEs. Should know: EU's enlargement process.
Modes of Study	Lectures 42 h 3. period, exercises 14 h 3. period and 14 h 4. period. Web-based learning environment platform Blackboard is used in this course.
Evaluation	0-5, examination 50 %, exercises 25 %, research report 25 %.
Study materials	Lecture handouts. Tiusanen, Tauno: Foreign Investors in Transitional Economies: Cases in manufacturing and Services, Northern Dimension Research Centre, Publication n:o 27, Lappeenranta University of Technology 2006. Tiusanen Tauno: Business Climate in Transitional Economies, Northern Dimension Research Centre, Publication n:o 48, Lappeenranta University of Technology 2008. Tiusanen Tauno: Development of rouble exchange rate in Russia, Northern Dimension Research Centre, Publication n:o 45, Lappeenranta University of Technology 2007. Tiusanen, Tauno: Romania and Bulgaria - Two New EU Members, Northern Dimension Research Centre, Publication n:o 44, Lappeenranta University of Technology 2007.
Prerequisites	CS10A0550 International Business Methods.

CS30A6100	TECHNOLOGY MANAGEMENT	6 ECTS cr
	Technology Management	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration. Course will be lectured in the autumn semester 2008 at GSOM.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Marko Torkkeli Professor N.N., GSOM	
Aims	Person in Charge: Professor, D.Sc. (Tech.) Marko Torkkeli Europe is waking up to the challenge of technology and innovation. We see EU commitment to spend 3% of GDP on R&D, but who is thinking about how to spend? Who is thinking about technology management? Does the corporate board have the means to manage this spend? Should some percentage of the R&D be spent on improving technology and innovation management? This is where this course makes a contribution. It brings together the latest practice, research findings and thinking, presented in a way that addresses top management requirements. The goal is to secure the economic future of the firm, in the context of a sustainable industry and society. Using the ideas and methods, the board can assess and improve its own ability to deal with the challenge of technology and innovation.	
Content	The course examines the significant issues related to managing technology from both strategic and tactical perspectives. It is designed to meet the needs of students who must understand the use of technology as a powerful tool of competitive advantage and growth. Open innovation, technology management and evaluation methods, and strategic innovation management issues are covered during the course.	
Modes of Study	Lectures 42 h, 1-2 period. Exam.	
Evaluation	Exam	
Study materials	George S. Day, Paul J. H. Schoemaker (Eds.): Wharton on Managing Emerging Technologies, John Wiley & Sons, 2000 European Institute for Technology and Innovation and European Institute for Technology Management: Bringing Technology and Innovation into the Boardroom, 2003 Rita Gunther McGrath, Ian MacMillan: The Entrepreneurial Mindset, Harvard Business School Press, 2000 Other assigned literature to be announced later.	
MITIM-HAR	INTERNSHIP AND INTERIM REPORT	6 ECTS cr
	Internship and Interim Report	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2	

7 The International Business and Technology Management Programme IBTM

IBTM programme is intended for international exchange and Finnish students. All the courses are taught in English and offered on several aspects of international business, technology management and transitional economies. Students can select the most desirable courses from a total selection of approximately 20 different courses per semester. About 30 ECTS credits represent the workload of a semester. The curriculum is managed by the School of Business, the Department of Industrial Management and the International Services.

The duration of the IBTM programme is one academic year, but a student can choose whether to come for one semester or two semesters.

The application deadline for the autumn semester / academic year is 15.5. and 15.10. for the spring semester.

More information on the programme and courses can be found at the following website:
www.lut.fi/exchange

Inquiries should be addressed to the following E-mail address:
incomingexchange@lut.fi

Autumn Semester 2009

August 26 – December 18

1st period/August 26 - October 23

2nd period/October 26 - December 18

Orientation Days, August 26-27

Subject to alterations

<i>Course number, Course</i>	<i>ECTS cr</i>
AB30A0300 International Finance and Emerging Markets	5
AC30A6000 Organizational Culture and Gender Aspects in Management	5
AC40A0101 Cross-Cultural Marketing Strategies	6
AC40A0201 Internationalization of the Firm	6
AC40A0451 High Technology Marketing	6
AC40A6000 Introduction to International Business and Planning	3
AC50A0300 Organizational Learning and Competence Management	6
AC60A0350 Multivariate and Econometric Analysis Methods	6
AC60A0400 International Accounting and Analysis	6
CS10A0550 International Business Methods	7
CS10A0650 Management of High-Tech Enterprises and Innovations in Russia	5
CS10A0800 The Basics of Doing Business in Russia	5
CS10A7000 The Economies of the Baltic States	3
CS30A1551 System Dynamics and Industrial Management	5
CS30A7000 Technology Management in Japan	3
CS30A7100 Management of Technology	5
CS30A7200 Global Innovation Networks	3
CS34A0400 Strategic Entrepreneurship in Age of Uncertainty	5
FV18A9900 Finnish Society and Culture	2

AB30A0300	INTERNATIONAL FINANCE AND EMERGING MARKETS 5 ECTS cr
	International Finance and Emerging Markets
	Language of teaching is English.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2
Teacher(s)	D.Sc. (Econ. & Bus. Adm.) Kashif Saleem
Aims	The aim of the course is to introduce the international finance theory and to help students understand the issues brought by the international dimension to the investment decision process. Furthermore, the course introduces various emerging markets and discusses their special characteristics.
Content	Foundations of international finance theory, foreign exchange rates, interest rates, international financial markets, asset pricing, portfolio management. Emerging financial markets especially Russia: Recent development, main characteristics and future directions.
Modes of Study	Lectures 21 h. Written term paper. Exam. Blackboard.
Evaluation	Graded 0-5 on the basis of the exam (80%) and term paper (20%).
Study materials	1. Literature will be decided later 2. Reading package 3. Handouts in the class and all additional material required by the lecturer.
Prerequisites	Basic studies in Finance required except Bachelor's thesis.
AC30A6000	ORGANIZATIONAL CULTURE AND GENDER ASPECTS IN MANAGEMENT 5 ECTS cr
	Organizational Culture and Gender Aspects in Management
	Language of instruction is English
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2
Teacher(s)	Professor, Ph.D. Albert J. Mills, Saint Mary's University, Halifax
Aims	Managers and other experts working in organizations need nowadays skills to work with the multiple questions related to gender equality. The course will provide students with understanding the interrelationships between organizational culture, management, and gendered practices at the workplace. The focus is in the question, how the managers will be able to identify, assess and address the organizational processes that lead to discriminatory outcomes for women and men at work. Organizational cultures with multiple values and practices that both women and men find comfortable to work with are crucial for every modern organization.
Content	1. Understanding organizational culture. Its definition, discussion and methods of analysis. 2. Gender and organizational culture. An overview of an organizational culture approach to understanding the development of discriminatory practices of men and women in the corporation. 3. Examination of selected issues to be drawn from corporate image-making, communication, structure, organizational rules, discourse analysis, group dynamics and interpersonal relations, studied in relation to the questions about gendered practices in the organization. 4. Equality practices in Finland. 5. Managing gender at work - issues and debates.
Modes of Study	Intensive course (October 26 - 30). 24 hours of lectures, case exercises and group work. An important element of the course will involve small groups of 3-4 students analyzing and discussing assigned cases.
Evaluation	Graded 0-5; the final grade will consist of (a) class participation (20%), (b) four

Study materials	in-class exercises (15% each), and (c) a final group presentation (20%). Articles, book chapters and cases to be specified by the lecturers and read before the course
Prerequisites	Basic courses in Human Resource Management advisable

AC40A0101	CROSS-CULTURAL MARKETING STRATEGIES 6 ECTS cr
	Cross-Cultural Marketing Strategies
	All instruction will be in English. The number of attending students may have to be limited if the number of students exceeds 70.
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 2
Teacher(s)	Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	To familiarize the students with the factors in the cultural environment of business and to help them understand how these factors affect international marketing strategies.
Content	Central concepts in understanding culture and its role in business: dimensions and categorizations of culture, sense of time and space, communication and negotiation styles. Understanding the effects of globalization on culture. Using cultural concepts to analyze how firms adapt their marketing strategies to foreign cultures.
Modes of Study	21 hours of lectures with integrated exercises, assignments, written exam.
Evaluation	0-5, written exam 60%, assignments 40%.
Study materials	1. Broweys & Price (2008): Understanding Cross-Cultural Management, Prentice Hall. 2. Selected chapters of Usunier (2000): Marketing Across Cultures, Prentice Hall.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet

AC40A0201	INTERNATIONALIZATION OF THE FIRM	6 ECTS cr
	Internationalization of the Firm	
	All instruction will be in English.	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo	
Aims	To familiarize the students with the characteristics of the international market environment and theories of internationalization. To provide strategic views on international market selection and market entry.	
Content	Internationalization theories: e.g. the Uppsala model. Network Model and Born Globals. The fundamental management decisions connected with the internationalization processes: (1) Whether to internationalize, (2) Deciding which markets to enter, (3) Deciding how to enter the foreign market, (4) Designing the global marketing programme and (5) implementing and coordinating the global marketing programme.	
Modes of Study	21 hours of lectures and 14 hours of practical exercises.	
Evaluation	0-5 Active class participation. Exercises: oral and written project reports (30% of final grade). A written final examination (70% of final grade).	
Study materials	1. Hollensen, S.: Global Marketing – A Decision-oriented approach, 2004. 2. Assigned reading.	
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet. AC40A0050 Vienti- ja tuontitoiminta is recommended.	

AC40A0451	HIGH TECHNOLOGY MARKETING	6 ECTS cr
	High Technology Marketing	
	The number of students attending the course may have to be limited. In registration priority is given to LUT School of Business master's students. All instruction will be in English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen	
Aims	The aim is to understand whether marketing for firms operating in high technology markets is different from traditional marketing? And, if so, why and how?	
Content	To provide a deep understanding of the functions of marketing regarding challenges and opportunities in high technology products and markets. To assist the participants to understand the virtue and limitations of traditional marketing thinking and tools in emergent, high technology markets. The course will be offered as a blend of lectures, guest lectures, presentations and discussions of selected topics and practical problems. Updated insights regarding challenges and opportunities in high technology markets; The concepts of technology and "high-tech"; Innovations and new products in high-tech markets; Industry structure, industry changes and marketing implications; Marketing research in high-tech markets; Partnering; Entry timing; Marketing strategies in high technology markets, Organizing marketing activities in high-tech markets.	
Modes of Study	20 h of interactive lectures in the 1st period. 16 h of term paper presentations in the 1st period. Active participation. In- and out-class assignments.	
Evaluation	Term paper. 0-5 Active class participation and assignments (20% of the final grade). Term paper (40% of the final grade). Written exam (40% of the final grade). All assignments have to be passed.	
Study materials	1. Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2005) Marketing of High-Technology Products and Innovations. Second Edition. Pearson Prentice Hall. 2. Assigned reading.	
Prerequisites	Basic knowledge of international marketing.	
AC40A6000	INTRODUCTION TO INTERNATIONAL BUSINESS AND PLANNING	3 ECTS cr
	Introduction to International Business and Planning	
	Language of instruction is English	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2-3, Period 1	
Teacher(s)	D.Sc. (Econ.) Toivo S. Äijö, Top Trainers Group	
Aims	To familiarize the students with the fundamentals of international business in general and strategic planning for international business in particular, as well as to provide the students with the analytical skills required for critical evaluation of actual international business strategies.	
Content	The global environment and its effects on international business and strategies. Latest challenges and ideas in international business. The role and importance of competitive advantage and core competence in strategy formulation. The strategic planning system for international business: the scope, time frame and organization. The contents of the strategic plan for international marketing.	
Modes of Study	Intensive course (September 3-4 & 9-11). 25 hours of lectures and case	

Evaluation	exercises. Written examination.
Study materials	Graded 0-5 on the basis of case studies 20 % and written examination 80 % 1. James Taggart – Michael McDermott: The Essence of International Business, Prentice-Hall 1993 2. Other material will be announced during lectures
Prerequisites	Basic course in marketing

AC50A0300	ORGANIZATIONAL LEARNING AND COMPETENCE MANAGEMENT	6 ECTS cr
	Organizational Learning and Competence Management	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2-3	
Teacher(s)	Senior Lecturer, Ph.D. (Psych) Jianzhong Hong	
Aims	The aim of this course is to familiarize students to the state of the art literature, functioning principles and enabling tools regarding the subject.	
Content	The course consists of three parts of virtual participation and interaction: 1) intensive reading of the course materials presented on the web and required journal articles and book chapters; 2) case analysis and written report by group; and 3) case presentation and discussion in the virtual discussion forum. The case analysis is conducted based on the problem-based learning method.	
Modes of Study	2-3 periods. Info-meeting of the course at the beginning of the course and guiding session of the case analysis before the start of the group work. Reading summaries, online exam, group assignment and discussion through LUT virtual learning tool Blackboard.	
Evaluation	0-5, individual literature study 40%, group work on the case analysis 60%	
Study materials	1. Course materials presented on the Blackboard. 2. Assigned reading to be announced on the course web page.	

AC60A0350	MULTIVARIATE AND ECONOMETRIC ANALYSIS METHODS	6 ECTS cr
	Multivariate and Econometric Analysis Methods	
	Only for the students of the Master's Degree Program (CBU) in Business and Administration.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Kaisu Puumalainen, Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Heli Virta	
Aims	The course will familiarize students with basic multivariate and econometric methods of analysis. Empirical cross-sectional, time series and panel data from various fields of economics and business is used, and the students should be able to conduct both descriptive, predictive and explanatory research, and present the results of the analyses.	
Content	Multiple linear regression analysis, factor analysis, cluster analysis, general linear models. Special issues in regression modeling: dummy variables, non-linear models, simultaneous equations, probit/logit-models, limited dependent variables, instrumental variables. SAS software will be used.	
Modes of Study	Lectures 21 h, exercises 21 h, 1st–2nd period. Seminars 8 h, 2nd period. Written seminar report and presentation.	
Evaluation	0-5 based on seminar work, written report 75%, presentation 25%.	
Study materials	Hair, Joseph Jr. et al.: Multivariate data analysis. Prentice Hall, 1998. Hill, R. Carter – Griffiths, William E. – Judge, George G.: Undergraduate Econometrics, 2nd edition. 2001.	
Prerequisites	Basic courses in statistics and economics.	

AC60A0400	INTERNATIONAL ACCOUNTING AND ANALYSIS	6 ECTS cr
	International Accounting and Analysis	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Sanna Tilli	
Aims	The objective of the course is to enrich students' understanding of international accounting and financial reporting. Particular emphasis is on comparative and international aspects of accounting together with financial analysis. The objective of the course is also to instruct students how to interpret financial information and assess the performance and prospects of the firm and how to use financial statement information to prepare a valuation.	
Content	The course provides students knowledge of the main international differences in financial accounting, harmonization, international financial analysis, financial statement analysis, valuation, assessment of accounting quality and the link between accounting and finance.	
Modes of Study	Lectures 28 h. Term paper, exam. Blackboard in use.	
Evaluation	Graded 0-5 on the basis of the exam (80%) and the term paper (20%).	
Study materials	1. Nobes and Parker: Comparative International Accounting, 2006 2. Penman: Financial Statement Analysis and Security Valuation, 2007	
CS10A0550	INTERNATIONAL BUSINESS METHODS	7 ECTS cr
	International Business Methods, Kansainvälisen liiketoiminnan menetelmät	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Tauno Tiusanen Assistant, M.Sc. (Tech.) Anna Karhu	
Aims	Students know the advantages and disadvantages of different entry modes, and are able to evaluate risks and opportunities in the global markets.	
Content	Must know: The course reviews the various trade theories and the usefulness of them in practice. It explores the main features of international trading and business relations since the Second World War. Various types of markets and methods to evaluate them will be discussed. Modes of international operations will be introduced; special attention will be paid to exporting, contractual arrangements and foreign direct investment (FDI). Theoretical approaches which explain international factor mobility are analysed and practical examples discussed. Different currency regimes will be discussed. Should know: Trade agreements between nations, risks in international business. Nice to know: International financial markets, cultural factors in international business.	
Modes of Study	Lectures 42 h 1. period, excercises 14 h 1. period and 14 h 2. period. Web-based learning environment platform Blackboard is used in this course.	
Evaluation	0-5, examination 50 %, excercises 25 %, research report 25 %.	
Study materials	Lecture handouts. Bradley, Frank: International marketing strategy. London 2002. Luostarinen, Reijo - Welch, Lawrence: International Business Operations. Helsinki 1990.	
Prerequisites	CS10A0050 Introduction to International Business.	

CS10A0650	MANAGEMENT OF HIGH-TECH ENTERPRISES 5 ECTS cr AND INNOVATIONS IN RUSSIA
Year and Period	M.Sc. (Tech.) 1-2, Period 4
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	To know the state of high-tech sectors and innovations management in Russia.
Content	Must know: Key issues of technology and innovation management in Russia. Russian high-tech sectors. Should know: Russian innovation environment. Decision making in Russia, cultural characteristics. Management transformation in state owned and private companies. Nice to know: Managerial comparison between Russia and western countries in high-tech sectors. Transition of leadership and management in different business sectors. Suitable also for postgraduate studies.
Modes of Study	Literature exam. Introductory lectures.
Evaluation	0-5, examination.
Study materials	Nevens, M., Summe, G. and Uttal, B. (1990). "Commercializing Technology: What the Best Companies Do." Harvard Business Review May-June 1990: 154-163. Easingwood, C., Moxey, S. and Capleton, H. (2006). "Bringing High Technology to Market: Successful Strategies Employed in the Worldwide Software Industry." The Journal of Product Innovation Management 23:498-511. Bingham, P. (2003). "Pursuing Innovation in a Big Organization." Research Technology Management 46(4): 52-58. OECD (2005). Fostering Public-Private Partnership for innovation in Russia. OECD. ISBN 92-64-00965-5. Gianella, C. and Tompson W. (2007). "Stimulating Innovation in Russia: The Role of Institutions and Policies", OECD Economics Department Working Papers, No. 539, OECD Publishing. Fey, C., Adaeva, M. and Vitkovskaia, A. (2001). "Developing a Model of Leadership Styles: What Works Best in Russia?" International Business Review 10: 615-643. Oksana I., Kyrki, A., Selioukova, Y. and Väättänen, J. (2005). Case Study on Software Development Company –Opportunities and Challenges of Russian High-Tech Start-Up. Northern Dimension Research Centre, Publication 15, Lappeenranta University of Technology. Chesbrough, H. (2003). "The Era of Open Innovation." MIT Sloan Management Review 44(3): 35-41. Additional material will be announced on lectures.
Prerequisites	CS10A0800 The Basics of Doing Business in Russia.
CS10A0800	THE BASICS OF DOING BUSINESS IN RUSSIA 5 ECTS cr
	The Basics of Doing Business in Russia, Venäjän kaupan perusteet
Year and Period	B.Sc. (Tech.) 3, Period 2
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	To understand the special characteristics of Russian economy and society.
Content	Must know: Transition of Russian society and business environment. Should know: Living standard analysis, competitive advantages, industrial sectors, foreign direct investment and Russian business culture. Nice to know: Russia's economic and political integration with the world economy.
Modes of Study	Lectures 35 h, presentation 10 h, seminar work 40 h, 2nd period.
Evaluation	0-5, examination.
Study materials	Tiusanen, T.: Russia in the Global Economy. Northern Dimension Research

Prerequisites	Centre, Publication n:o 49, Lappeenranta University of Technology 2008. Lecture materials. Sufficient prior business studies required. Due to the teaching methods, the amount of participants may be limited. In this case the priority would be given to the students of Industrial Management.
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CS10A7000	THE ECONOMIES OF THE BALTIC STATES	3 ECTS cr
	The Economies of the Baltic States	
	Language of instruction is English	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	Professor, D.Sc. (Econ.) Alari Purju Tallinn University of Technology and Estonian Business School	
Aims	To familiarize the students with the Baltic economies including historical background, present characteristics and future trends.	
Content	Economic development and structural changes in Estonia, Latvia and Lithuania. Transition to market economy. Comparison of developments with other East European countries. Framework for business (tax system, other regulations). Structure of foreign trade. Trade with the EU and the CIS. Export impediments of enterprises. Introduction to economic problems of enterprises. Case studies. Role of foreign direct investments (FDI). The cycle theory of FDI. Real and monetary integration with the EU. What are the main factors determining future development of the Baltic states?	
Modes of Study	Intensive course (November 9-13). 20 hours of lectures, case studies and written examination (during last lectures). An essay.	
Evaluation	Graded 0-5 on the basis of active class participation and group case studies 60 %. A written examination 40 %.	
Study materials	1. Nielsen, Jorgen Ulf-Moller, Erik Strojer Madsen, Kurt Pedersen, International Economics. The wealth of open nations. Berkshire: McGraw-Hill Book Company, First print 1994. 2. Lumiste, Rünno, Robert Pefferly and Alari Purju, 2007, "Estonia's Economic Development: Trends, Practices and Sources"; The World Bank Working Paper. 3. Purju, Alari, 2004, "The institutional framework and trade pattern of the Baltic states after EU membership in trade with the CIS ", Turku School of Economics and Business Administration, Series C Discussion, ISSN 1456-4793, 20 p. 4. Case studies of enterprises, material http://www.hex.com/tallinn/riga/vilnius	
Prerequisites	Basic courses in international economy and marketing	

CS30A1551	SYSTEM DYNAMICS AND INDUSTRIAL MANAGEMENT	5 ECTS cr
	System Dynamics and Industrial Management, Systemidynamiikka tuotantotaloudessa	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2 int.	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli-Pekka Hilmola	
Aims	After completing this course student is able to model complex logistics systems and product development processes using system dynamics, and is able to report results for further managerial decision making.	
Content	In this course system dynamics is used in the modelling of logistics systems (distribution and supply chains) and product development processes. Objective of the course is to give an understanding for a student how to analyze systems through relationships of different modeling elements (delay, feedback/feed	

	forward, flow and stock), which often create complex interactions. Implications of system behavior on company level as well as country level issues of decision making in logistics as well as innovation management are discussed. During the course we also use and analyze practical problem solving tasks, using simulation models from the previous research. Suitable also for postgraduate studies.
Modes of Study	Lectures 12 h, and exercises as well as final seminar 14 h. 1.-2. period in intensive form.
Evaluation	0-5, exam (50 %) and seminar work (50 %).
Study materials	1. John D. Sterman (2000). Business Dynamics - Systems Thinking and Modeling for a Complex World, McGraw-Hill/Irwin. 2. Senge, Peter (1994). The Fifth Discipline. Currency Doubleday. 3. Article collection provided by the lecturer.
Prerequisites	Recommended: At least introductory courses taken from logistics/supply chain management as well as technology/innovation management.

CS30A7000	TECHNOLOGY MANAGEMENT IN JAPAN	3 ECTS cr
	Technology Management in Japan, Teknologian johtaminen Japanissa	
Year and Period	M.Sc. (Tech.) 1, Period 1 int.	
Teacher(s)	Professor, D.Sc. (Tech.) Ichimura Takaya	
Aims	The course will provide students with the background information needed to understand how the Japanese system of technology management operates. It will also inform students about the characteristics of Japanese management and how technology management has contributed to the development of Japanese industry. The course will also give an outline of the Japanese production system and how it is based on Japanese culture.	
Content	<ol style="list-style-type: none"> 1. Technology management as an innovation process 2. Management technology and the effectiveness 3. The cultural and historical background of Japan 4. Industrial development of Japan and their causes 5. The approach to establish a technology management system 6. Cases of Technology Management System in Japan <ol style="list-style-type: none"> 6.1 Toyota production system 6.2 Product development and improvement system 6.3 Work design for quality of working life(QWL) 6.4 Quality management system in Japan 6.5 The process and tools of problem solving 6.6 Environmental management system 7. Technology management in the global world 	
Modes of Study	16 hours of lectures and class discussions in English.	
Evaluation	0-5, active participation in classes and a written assignment.	
Study materials	Written material will be distributed during lectures.	
Prerequisites	Basic knowledge of production management.	

CS30A7100	MANAGEMENT OF TECHNOLOGY	5 ECTS cr
	Management of Technology	
	Language of instruction is English	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Tuomo Kässi	
Aims	The course develops a basic understanding of the issues and methods for managing technology as a strategic resource. The major issues in R&D Management and the process of technological innovation are included.	
Content	The course reviews basic ideas and concepts of strategic and operational technology management including: <ul style="list-style-type: none"> - The concept of strategy - Strategy alternatives 	

Modes of Study	- Management product systems - Management of innovation - The process of technology strategy formulation, implementation and management at company level, and of integration of technology strategy with business strategy - Management of innovative organizations
Evaluation	28 hours of lectures in English. Given assignments and written examination. Graded 0-5 on the basis of written examination 100 %
Study materials	1. Tidd, Joe - Bessant, John - Pavitt, Keith: Managing Innovation, Integrating Technological, Market and Organizational Change, John Wiley & Sons, England, 2001 2. Other assigned materials 3. Case material to be assigned
Prerequisites	Basic knowledge of strategic management

CS30A7200	GLOBAL INNOVATION NETWORKS	3 ECTS cr
	Global Innovation Networks	
	Language of instruction is English	
Year and Period	B.Sc. (Tech.) 3, Period 1	
Teacher(s)	Karol Pelc, Ph.D., Professor Michigan Technological University	
Aims	The students will gain knowledge of innovation network structures and their evolution under conditions of business globalization. They will become familiar with management issues within global innovation networks.	
Content	The course presents conceptual models and empirical data on innovation networks in the context of global scale projects and organizations. It includes the following topics: - Schumpeterian perspective on innovation networks and basic concepts related to technological innovation - Global networks for knowledge generation, and collaborative practices in global product development, production, marketing and distribution - Strategic roadmapping and knowledge management in a global organization - Issues of intellectual property in the global networking environment. Discussion will include issues related to impact of global economic down- and up-turns on innovation strategies.	
Modes of Study	Intensive course (September 28 - October 2). 20 hours of lectures, class discussions, case study workshop, reporting and written examination.	
Evaluation	Graded 0-5 on the basis of case study assignment, active participation, and a written examination. The grade will be based on components: Case study review 10 %, class discussion 10 %, final exam 80 %.	
Study materials	The students will have access to lecture materials prior to each class and will receive case descriptions for study. 1. Boutellier, R., Gassman, O., Von Zedtwitz, M., Managing Global Innovation, Third Edition, Springer, Berlin and Heidelberg 2008. 2. Chesbrough, H., Vanhaverbeke, W., West, J. (eds.), Open Innovation: Researching New Paradigm, Oxford University Press, Oxford and New York 2008 (paperback edition). 3. Deresky, H., Global Management: Strategic and Interpersonal, Prentice Hall, 2002.	
Prerequisites	Basic knowledge of management and economics	

CS34A0400	STRATEGIC ENTREPRENEURSHIP IN AGE OF 5 ECTS cr UNCERTAINTY
	Strategic Entrepreneurship in Age of Uncertainty, Strateginen yrittäjyys ja epävarmuuden hallinta
Year and Period	M.Sc. (Tech.) 2, Period 1
Teacher(s)	Professor, D.Sc. (Tech.) Marko Torkkeli
Content	Must know: This course examines issues related entrepreneurship and entrepreneurial mindset. Entrepreneurial mindset. Identifying opportunities. Management of market and technology uncertainty.
Modes of Study	Lectures 28 h, 1. period.
Evaluation	0-5, a written report.
Study materials	Lectures. McGrath Rita and MacMillan Ian, (2000). The Entrepreneurial Mindset. Harvard Business School Pr.

FV18A9900	FINNISH SOCIETY AND CULTURE	2 ECTS cr
	Finnish Society and Culture	
	Language of instruction is English	
Year and Period	Period 1-2 and 3-4	
Teacher(s)	Dr. Kalle Michelsen, Professor M.A. Kristiina Korjonen-Kuusipuro, Researcher Ph.D. Tuija Mikkonen, Postdoc Researcher Dr. Mika Tonder, Senior Lecturer	
Aims	The aim of this course is to introduce Finland and South Karelia to foreign students. The course provides basic information of Finnish history (focusing on Karelia and Karelian issues) from 1809 to the present, culture (arts, architecture and landscape), political system and international issues as well as social and economic systems (demography, ethnic, regional, gender and equality issues, trade, industry, science and technology).	
Modes of Study	22 h lectures in English. The course is divided in following parts: A) History (4 lectures) B) Culture (4 lectures) C) Lifestyle (4 lectures) D) Architecture and Built Environment (2 lectures) E) Society (2 lectures) F) Economic Systems (2 lectures) F) Nature and Landscape (4 lectures) G) Exam (2 lectures)	
Evaluation	Pass/fail on the basis of participation 60% and a written examination 40%.	
Study materials	Portraying Finland. Facts and Insights. Otava 2005. (Available in the library)	

Spring Semester 2010
January 7 - May 143rd period/January 7 - March 54th period/March 8 - May 14**Orientation Days, January 7-8***Subject to alterations***SG IBTM Spring**

		<i>ECTS cr</i>
AB30A0250	Theory of Corporate Finance	7
AB30A0550	International Financial Management	6
AB30A0600	Empirical Research in Accounting and Finance	7
AB40A0500	Innovation and Competitiveness	5
AC30A6050	Small and Medium Size Enterprise Management and Business Development	3
AC40A0150	Integrated Marketing Communication	5
AC40A0251	Sales Management and Personal Selling	6
AC40A0551	International Entrepreneurship	6
AC40A0651	International Business Strategies	6
AC40A6050	Cross-Cultural Encounters	3
CS10A0050	Introduction to International Business	4
CS10A0600	Doing Business in Transitional Economies	7
CS10A0650	Management of High-Tech Enterprises and Innovations in Russia	5
CS10A0750	Enterprises and Competition in Russia	5
CS10A0851	Transitional Countries Integration with the European Union	5
CS30A1500	Transportation Systems	5
CS34A0500	Technology Commercialization and Corporate Venturing	5
FV18A9900	Finnish Society and Culture	2

AB30A0250	THEORY OF CORPORATE FINANCE	7 ECTS cr
	Theory of Corporate Finance	
	Language of teaching is English	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen	
Aims	The course is providing advanced knowledge in the area of corporate finance. Latest relevant research in the area is incorporated taking to account the practical aspects of combining theoretical aspects to practice. Moreover, the focus is also to learn how to deepen the knowledge in some specific area with the help of research articles.	
Content	Specific issues of corporate finance include dividends, valuation, mergers and acquisitions, listings, IPOs, ownership structures, corporate governance, asymmetric information and international finance.	
Modes of Study	Lectures/seminar 21 h, 4th period. Term paper (In written form, paper is presented by students in the seminar). Exam. Blackboard in use.	
Evaluation	Graded 0–5 on the based on 80% exam and 20% term paper	
Study materials	1. Ross, S.A., Westerfield, R.W. – Jaffe, J.: Corporate Finance, 7th edition, selected parts 2. Copeland, T., Weston, J.F. - Shastri, K.: Financial Theory and Corporate Policy, 2003, selected parts. 3. Handouts in the class and all additional material required by the lecturer.	
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor's thesis)	
AB30A0550	INTERNATIONAL FINANCIAL MANAGEMENT	6 ECTS cr
	International Financial Management	
	Language of teaching is English	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen	
Aims	The aim of the course is to provide an analytic framework for understanding how cross-border financing, valuation, risk management, and investment decisions are influenced by a variety of factors including exchange rates, legal rules, international tax considerations and country risks. The course provides the understanding how firms can create, measure, and sustain value across borders.	
Content	The course consists of the four different areas in international financial management. The part including currencies and asset prices concentrates in the mechanisms of exchange rates. The area of multinational financial decision making considers several of the central financial decisions multinational firms must make. The part of cross-border valuation and financing considers how the valuation and financing decisions must be modified in a cross-border setting. Institutions and Finance part includes the topics of investors' behavior and risk management.	
Modes of Study	Lectures 24 h, 3rd period. Course work (Assignment on a topic of mutual agreement, which can be written individually or in groups of up to three members). Exam. Blackboard in use.	
Evaluation	Graded 0–5 based 80% on an exam and 20% on course work.	
Study materials	1. Madura, J., International Financial Management, 8th edition, or later version 2. Handouts in the class and all additional material required by the lecturer.	
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor's thesis)	

AB30A0600	EMPIRICAL RESEARCH IN ACCOUNTING AND 7 ECTS cr FINANCE
	Empirical Research in Accounting and Finance
	Language of teaching is English
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4
Teacher(s)	Docent, D.Sc. (Econ. & Bus. Adm.) Jussi Nikkinen Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen
Aims	The course has the following two objectives. First, the course provides an overview of recent relevant research issues in accounting and finance, thereby extending and deepening students' knowledge in the area of accounting and finance. Second, the course is intended to prepare students to do empirical research in accounting and finance.
Content	Relevant research issues related to financial reporting; corporate governance; agency relationships; managerial incentive plans; market efficiency; information content of asset prices; accounting, capital markets and financial institutions; international financial markets.
Modes of Study	Lectures/seminar 21 h. Over the course of the term there will be two to three assignments, such as an article analysis. The aim of these assignments is to get students to understand the principles of deductive empirical research. The main course requirement is to write a term paper from the area of accounting or finance containing at minimum a detailed well-developed research proposal. Blackboard in use.
Evaluation	Graded 0–5 on the basis of the term paper.
Study materials	There is no textbook. Issues covered in class will be based on research papers and articles.
Prerequisites	Compulsory B.Sc. courses in Accounting or in Finance (except Bachelor's thesis). AC40A0010 Tilastollisen analyysin perusteet (Basic Course in Statistical Analysis Method) and AB40A0100 Monimuuttujamenetelmät (Multivariate Analysis Methods or Ka6710100 Quantitative Research Methods I)
AB40A0500	INNOVATION AND COMPETITIVENESS 5 ECTS cr
	Innovation and Competitiveness
	Access to this course is limited to 40 participants. First priority is given to students who have Strategy Research as major or minor subject in their studies and second priority to other students from School of Business.
Year and Period	B.Sc. (Econ. & Bus. Adm.) 1, Period 4
Teacher(s)	Docent, Ph.D. Hannes Toivanen Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Ari Jantunen
Aims	This course explores the relationship between innovation and competitiveness of firms, industries, and nations. Assigned literature, lectures, and class work consider critical issues in competitive strategy and public policy. The course provides an accessible overview of major theoretical perspectives on innovation and key methods employed to measure and assess the impact of innovation.
Content	What is innovation, the innovation process and firm, industrial organization and innovation, national systems of innovation, measurement of innovation, special aspects of innovation, contemporary challenges of innovation.
Modes of Study	21 h of lectures. Exam.
Evaluation	0-5
Study materials	Will be announced later, see web-pages.

AC30A6050	SMALL AND MEDIUM SIZE ENTERPRISE MANAGEMENT AND BUSINESS DEVELOPMENT	3 ECTS cr
	Small and Medium Size Enterprise Management and Business Development	
	Language of instruction is English	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Timo Pihkala	
Aims	To provide students with a multi-perspective of concepts, frameworks, and models for understanding and analysing growth situations in SMEs.	
Content	The course focuses on the decisions owners/managers have to make in: <ul style="list-style-type: none"> - identifying and choosing opportunities for business growth - setting realistic growth strategies - identifying and allocating resources (technological, financial, human etc.) - organising, mobilising, motivating, empowering and rewarding staff - exercising control over all aspects of the business during the growth process - developing an organisational climate compatible with the internal and external factors necessary for growth. 	
Modes of Study	20 hours of lectures and class discussions in English. The teaching method is student-centred. Students are expected to come thoroughly prepared for vigorous discussions on the readings and case studies issued in advance.	
Evaluation	Graded 0-5 on the basis of article analyses 100 %	
Study materials	Compendium of articles and cases	
Prerequisites	Basic knowledge of management	
AC40A0150	INTEGRATED MARKETING COMMUNICATION	5 ECTS cr
	Integrated Marketing Communication	
	All instruction will be in English.	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 4	
Teacher(s)	Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	To familiarize the student with the concept and process of marketing communication. To give the students basic skills in the design, implementation and management of communication as part of the marketing process.	
Content	The role of marketing communication in the marketing strategy of an enterprise. The concept and implementation of integrated marketing communication. The design, implementation and management of advertising, sales promotion and public relations. The introduction of electronic and print media, media choice, the creative process and execution of a promotion campaign. The services in campaign planning, the advertising business and the advertiser-agency relationship. Legal and ethical issues in advertising. The course focuses especially on mass communication because there is a separate course available in personal selling and sales management.	
Modes of Study	28 hours of lectures, 14 hours of exercises, groupwork and an individual ad analysis report, 4th period. Written exam.	
Evaluation	0-5, written exam 50%, individual ad analysis 30%, groupwork 20%.	
Study materials	1. Percy, Rossiter & Elliott (2001): Strategic Advertising Management, Oxford University Press. 2. Assigned reading.	
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet, CS10A0000 Markkinoinnin peruskurssi or Ka6720000 Markkinoinnin ja hankintatoimen perusteet	

AC40A0251	SALES MANAGEMENT AND PERSONAL SELLING	6 ECTS cr
	Sales Management and Personal Selling	
	All instruction will be in English.	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 3-4	
Teacher(s)	Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen	
Aims	To familiarize the students with the fundamentals of sales management and personal selling including negotiation skills as well as general issues in business to business and organizational selling.	
Content	Special characteristics of business-to-business, industrial and organizational selling. Fundamentals of personal selling, negotiations and sales management.	
Modes of Study	24 h of lectures in 3rd period. 14 h of exercises in 4th period. Written exam.	
Evaluation	0-5, written examination 60% of the final grade, Exercises 40% of the final grade	
Study materials	1. Johnston, Mark W. and Greg Marshall, 2006. Churchill/Ford/Walker's Sales Force Management. McGraw-Hill/Irwin, New York. 2. Manning, Gerald L., and Barry Reece, 2004. Selling Today, Creating Customer Value. 9th edition. Pearson Prentice hall, New Jersey. 3. Other material distributed during the course.	
Prerequisites	Ka6720000 Markkinoinnin ja hankintatoimen perusteet or AC40A0000 Kansainvälisen markkinoinnin perusteet (AC40A0050 Vienti- ja tuontitoiminta recommended).	
AC40A0551	INTERNATIONAL ENTREPRENEURSHIP	6 ECTS cr
	International Entrepreneurship	
	All instruction will be in English. The number of students attending the course may have to be limited based on pre-exam if the number of students exceeds 30.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo, Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen	
Aims	To provide the students with both theoretical and practical insight into the processes of international entrepreneurship. To help the students develop an understanding of the nature and benefits of an international expansion strategy. The field project will expose the students to actual challenges that entrepreneurs have to deal with when internationalizing their businesses.	
Content	Evolution of International entrepreneurship, development of internationalization plan, competitive strategies and international business operations for small and medium-sized firms: e.g. marketing, human resources, R&D and financing, managing entrepreneurial ventures in the global marketplace. In the field project the students apply tools and frameworks related to international entrepreneurship to analyze a particular opportunity and create a business plan.	
Modes of Study	12 h of lectures including guest entrepreneurs as lecturers, 3.-4. period. 12 h of field project presentations, 3.-4. period.	
Evaluation	Group tutorials. 0-5 Active class and tutorial participation Assignment 1: Case narrative of chosen firm/ entrepreneur (10% of final grade) Assignment 2: Field project & Presentation (50% of final grade) (Peer evaluation in the group work has an effect on the grade) Exam (40% of final grade)	
Study materials	1) Äijö Toivo, Kuivalainen Olli, Saarenketo Sami, Lindqvist Jani & Hanninen Hanna (2005) Internationalization Handbook for the Software Business, Centre	

Prerequisites	of Expertise for Software Product Business, Espoo 2005. 2) Assigned reading Basic understanding of international business. Entrepreneurship studies are recommended.
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AC40A0651	INTERNATIONAL BUSINESS STRATEGIES	6 ECTS cr
	International Business Strategies	
	The number of students attending the course may have to be limited based on pre-exam if the number of students exceeds 80. In registration priority is given to LUT School of Business' master's students and foreign exchange students with earlier knowledge of international business. All instruction will be in English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 3-4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Senior Lecturer, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen	
Aims	The aim of the course is to familiarize the students with strategic planning for international business in general and the management and execution of international business strategies within the context of multinational corporations in particular. To help the students to develop an understanding of various international or global strategies and their advantages and disadvantages. The assignment aims to expose the students to actual management challenges in an international context.	
Content	International business planning. International and global business strategies. Strategic tools for analyzing the internal and external environment, for example resource and product positions. Organization of resources and capabilities within a multinational corporation. Implementation of an international business strategy.	
Modes of Study	14 h of interactive lectures, 3rd period. 14 h of interactive lectures, 4th period. Group assignment/project work.	
Evaluation	Exam. 0-5. Active class participation. Assignment: oral and written project work, 80%. Exam (has to be passed), 20%.	
Study materials	Course books: Lasserre, P. (2007). Global Strategic Management 2nd Edition. Palgrave. Peng, M. W. (2006). Global Strategy. Thomson South-West. Assigned reading.	
Prerequisites	Basic understanding of international business.	

AC40A6050	CROSS-CULTURAL ENCOUNTERS	3 ECTS cr
	Cross-Cultural Encounters	
	Language of instruction is English	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 3	
Teacher(s)	M.A. Tanja Karppinen, Coordinator M.A. Kristiina Korjonen-Kuusipuro, Researcher M.A. Aino Harinen, Planning Officer Person in Charge: M.A. Tanja Karppinen, Coordinator	
Aims	The purpose of the course is to develop students' abilities to understand and appreciate cultural differences both in business and private life.	
Content	Cultures and communication, verbal and nonverbal communication, national stereotypes, intercultural sensitivity, cross-cultural interaction, culture shock,	

Modes of Study Evaluation	adaptation, intercultural effectiveness, cultures and organisations, expatriate assignments. 24 hours of lectures and case exercises in English Graded 0-5 on the basis of activity, assignments given during the lectures and a portfolio composed of them.
Study materials	Case exercises 80 %, active participation and attendance 20 %.
Prerequisites	Reading material for the course provided by the lecturer Active participation and 80 % attendance

CS10A0050	INTRODUCTION TO INTERNATIONAL BUSINESS	4 ECTS cr
Year and Period	Introduction to International Business, Johdatus kansainväliseen liiketoimintaan	
Teacher(s)	B.Sc. (Tech.) 2, Period 4 Professor, Ph.D. Tauno Tiusanen	
Aims	Students have the basic knowledge of international business.	
Content	Must know: Basic definitions and features of international business will be introduced. Attention will be paid to foreign trade theories and alternatives in export business. Balance of payments on current account will be overviewed. Should know: Different trade policy alternatives are overviewed. Currency issues, especially exchange rates will be discussed. Evaluation of export markets and communicating across cultures.	
Modes of Study Evaluation	Lectures 21 h 4. period. 0-5, examination.	
Study materials	Lecture handouts. Root, Franklin: Entry Strategies: for International Markets. 1994. Three first chapters.	

CS10A0600	DOING BUSINESS IN TRANSITIONAL ECONOMIES	7 ECTS cr
Year and Period	Doing Business in Transitional Economies, Liiketoiminta siirtymätalouksissa	
Teacher(s)	M.Sc. (Tech.) 1, Period 3-4 Professor, Ph.D. Tauno Tiusanen Assistant, M.Sc. (Tech.) Anna Karhu	
Aims	Students are able to evaluate the emerging markets and choose the right modes of operations in TEs.	
Content	Must know: Country profiles of European transitional economies (TEs). The communist legacy in TEs. Macro-economic framework of the transitional process. Post-communist region in the global economy. Risks and opportunities in the TE markets. Investment climate and foreign direct investment in the TEs. Should know: EU's enlargement process.	
Modes of Study Evaluation	Lectures 42 h 3. period, exercises 14 h 3. period and 14 h 4. period. Web-based learning environment platform Blackboard is used in this course. 0-5, examination 50 %, exercises 25 %, research report 25 %.	
Study materials	Lecture handouts. Tiusanen, Tauno: Foreign Investors in Transitional Economies: Cases in manufacturing and Services, Northern Dimension Research Centre, Publication n:o 27, Lappeenranta University of Technology 2006. Tiusanen Tauno: Business Climate in Transitional Economies, Northern Dimension Research Centre, Publication n:o 48, Lappeenranta University of Technology 2008. Tiusanen Tauno: Development of rouble exchange rate in Russia, Northern Dimension Research Centre, Publication n:o 45, Lappeenranta University of Technology 2007.	

Prerequisites	Tiusanen, Tauno: Romania and Bulgaria - Two New EU Members, Northern Dimension Research Centre, Publication n:o 44, Lappeenranta University of Technology 2007. CS10A0550 International Business Methods.
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CS10A0650	MANAGEMENT OF HIGH-TECH ENTERPRISES 5 ECTS cr AND INNOVATIONS IN RUSSIA
Year and Period	M.Sc. (Tech.) 1-2, Period 4
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	To know the state of high-tech sectors and innovations management in Russia.
Content	Must know: Key issues of technology and innovation management in Russia. Russian high-tech sectors. Should know: Russian innovation environment. Decision making in Russia, cultural characteristics. Management transformation in state owned and private companies. Nice to know: Managerial comparison between Russia and western countries in high-tech sectors. Transition of leadership and management in different business sectors. Suitable also for postgraduate studies.
Modes of Study	Literature exam. Introductory lectures.
Evaluation	0-5, examination.
Study materials	Nevens, M., Summe, G. and Uttal, B. (1990). "Commercializing Technology: What the Best Companies Do." Harvard Business Review May-June 1990: 154-163. Easingwood, C., Moxey, S. and Capleton, H. (2006). "Bringing High Technology to Market: Successful Strategies Employed in the Worldwide Software Industry." The Journal of Product Innovation Management 23:498-511. Bingham, P. (2003). "Pursuing Innovation in a Big Organization." Research Technology Management 46(4): 52-58. OECD (2005). Fostering Public-Private Partnership for innovation in Russia. OECD. ISBN 92-64-00965-5. Gianella, C. and Tompson W. (2007). "Stimulating Innovation in Russia: The Role of Institutions and Policies", OECD Economics Department Working Papers, No. 539, OECD Publishing. Fey, C., Adaeva, M. and Vitkovskaia, A. (2001). "Developing a Model of Leadership Styles: What Works Best in Russia?" International Business Review 10: 615-643. Oksana I., Kyrki, A., Selioukova, Y. and Väättänen, J. (2005). Case Study on Software Development Company –Opportunities and Challenges of Russian High-Tech Start-Up. Northern Dimension Research Centre, Publication 15, Lappeenranta University of Technology. Chesbrough, H. (2003). "The Era of Open Innovation." MIT Sloan Management Review 44(3): 35-41.
Prerequisites	Additional material will be announced on lectures. CS10A0800 The Basics of Doing Business in Russia.

CS10A0750	ENTERPRISES AND COMPETITION IN RUSSIA 5 ECTS cr
	Enterprises and Competition in Russia, Yritykset ja kilpailu Venäjällä
Year and Period	M.Sc. (Tech.) 1, Period 3
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	To understand Russian business environment, enterprise structures and competition on Russian markets.
Content	Must know: Russian enterprise structures, emergence of new enterprises, natural resources and consumer markets. Should know: Russia's competitiveness, deregulation of the economy,

Modes of Study	privatisation process and foreign direct investment development.
Evaluation	Nice to know: Government regulations and licensing.
Study materials	Lectures 35 h, presentations 20 h, seminar work 40 h, 3rd period. 0-5, examination. The World Bank. Transition, the First Ten Years - Analysis and Lessons for Eastern Europe and the Former Soviet Union. 2002. Raj, D. and Goldberg, I. 2007. Enhancing Russia's Competitiveness and Innovative Capacity. The World Bank. Washington DC. Additional material will be announced on lectures.
Prerequisites	CS10A0800 The Basics of Doing Business in Russia, not required from foreign exchange students. Sufficient prior business studies required. Due to the teaching methods, the amount of participants may be limited. In this case the priority would be given to the students of Industrial Management.
CS10A0851	TRANSITIONAL COUNTRIES INTEGRATION WITH THE EUROPEAN UNION 5 ECTS cr
	Transitional Countries Integration with the European Union , Siirtymätalouksien integroituminen Euroopan Unioniin - kaupan, tuotannon ja työvoiman näkökulma
Year and Period	M.Sc. (Tech.) 1, Period 4
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	To understand the process of European Union enlargement and its influence on the competitiveness of EU.
Content	Must know: European Union enlargement process and competitiveness of EU. Should know: Special characteristics of new EU countries. Trade and investment flows. Nice to know: Harmonization of legislation and economies. Provisions for European Union enlargement.
Modes of Study	Lectures 35 h, presentations 20 h, seminar work 40 h, 4th period.
Evaluation	0-5, examination.
Study materials	UNCTAD, World Investment Report 2009, United Nations 2009. Tiusanen, T.: Business Climate in Transitional Economies. Northern Dimension Research Centre, Publication n:o 48, Lappeenranta University of Technology 2008. Additional material will be announced on lectures.
Prerequisites	Sufficient prior business studies required. Due to the teaching methods, the amount of participants may be limited. In this case the priority would be given to the students of Industrial Management.
CS30A1500	TRANSPORTATION SYSTEMS 5 ECTS cr
	Transportation Systems, Kuljetusjärjestelmät
Year and Period	M.Sc. (Tech.) 1-2, Period 4 int.
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli-Pekka Hilmola
Aims	Finland's logistical position in Europe as well as in the global context. Course will give basic understanding from different transportation modes (air, road, sea and rail), and their relation to users (e.g. companies) financial and non-financial performance. Combining different modes of transportation to represent overall transportation service (e.g. automation and containers). Role of Russia and Asia in the transportation flows of Europe. Third party logistics solutions. Value enhancement in logistical services and processes, M&A waves, and the reasons for service provider integration.
Content	Among lectures, course contains case exercises (which will combine the issues of different transportation modes together), and by participating in all of these, student will have some amount of basic points for exam.
Modes of Study	Lectures 14 h and cases 12 h as intensive teaching in the 4th period.
Evaluation	0-5, examination (70 %) ja accepted case exercises (30 %).
Study materials	1. Häkkinen, Lotta (2005). Operations Integration and Value Creation in

<p>Prerequisites</p>	<p>Horizontal Cross-Border Acquisitions. Turku School of Economics and Business Administration, A-6 (Doctoral Diss.). Available at URL: http://www.tukkk.fi/julkaisut/vk/Ae6_2005.pdf</p> <p>2. Woxenius, Johan (1998). Development of Small-Scale Intermodal Freight Transportation in a System Context. Chalmers University of Technology, Report 34 (Doctoral Diss.). Available at URL: http://www.mot.chalmers.se/staff/johwox/_private/English/Reports/1998%20Dissertation%20Woxenius.pdf</p> <p>3. Hilmola, Olli-Pekka, Ulla Tapaninen, Erik Terk & Ville-Veikko Savolainen (2007). Container Transit in Finland and Estonia – Current Status, Future Demand and Implications on Infrastructure Investments in Transportation Chain. Publications from the Centre for Maritime Studies, University of Turku, A44. Available at URL: http://www.okt-infra.fi/file/lid199/files/attachment/OKT_Infra_Cont_Report.pdf</p> <p>4. Terk, Erik, Ulla Tapaninen, Olli-Pekka Hilmola & Tonis Hunt (2007). Oil Transit in Estonia and Finland – Current Status, Future Demand, and Implications on Infrastructure Investments in Transportation Chain. Publications of Estonian Maritime Academy, No. 4, 2007. Available at URL: http://www.okt-infra.fi/file/lid206/files/attachment/OKT_Infra_Oil_Report_a.pdf</p> <p>5. Ivanova, Oksana, Tero Toikka & Olli-Pekka Hilmola (2006). Eurasian Container Transportation Market: Current Status and Future Development Trends with Consideration of Different Transportation Modes. Lappeenranta University of Technology, Department of Industrial Engineering and Management. Research Report 179. Available at URL: http://kouvola.lut.fi/file/lid980/files/attachment/Research_Report_179_Nora.pdf</p> <p>6. Additional material provided by the lecturer (notes, articles and case exercises).</p> <p>Recommended to have taken some logistical courses before, e.g. from topics of supply chain management and production control.</p>
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<p>CS34A0500</p>	<p>TECHNOLOGY COMMERCIALIZATION AND CORPORATE VENTURING 5 ECTS cr</p>
<p>Year and Period</p> <p>Teacher(s)</p> <p>Aims</p> <p>Content</p> <p>Modes of Study</p> <p>Evaluation</p> <p>Study materials</p>	<p>Technology Commercialization and Corporate Venturing, Teknologian kaupallistaminen</p> <p>M.Sc. (Tech.) 1-2, Period 4 int. Professor, D.Sc. (Tech.) Marko Torkkeli Visiting lecturers</p> <p>To understand the characteristics of technology commercialization and high growth technology ventures.</p> <p>This course examines issues related technology commercialization, corporate venturing, and ways to profitably exploit business opportunities. Business models. Suitable also for postgraduate studies.</p> <p>Lectures and guest speakers 28 h as intensive teaching in the 4th period. Written report.</p> <p>0-5. Written report 100 %.</p> <p>Lectures and course pack. Block Zenas and MacMillan Ian (1985) Corporate Venturing: Creating New Businesses Within the Firm. Harvard Business School Pr. McGrath Rita and MacMillan Ian, (2005). MarketBusters: 40 Strategic Moves That Drive Exceptional Business Growth. Harvard Business School Pr.</p>

FV18A9900	FINNISH SOCIETY AND CULTURE	2 ECTS cr
	Finnish Society and Culture	
	Language of instruction is English	
Year and Period	Period 1-2 and 3-4	
Teacher(s)	Dr. Kalle Michelsen, Professor M.A. Kristiina Korjonen-Kuusipuro, Researcher Ph.D. Tuija Mikkonen, Postdoc Researcher Dr. Mika Tonder, Senior Lecturer	
Aims	The aim of this course is to introduce Finland and South Karelia to foreign students. The course provides basic information of Finnish history (focusing on Karelia and Karelian issues) from 1809 to the present, culture (arts, architecture and landscape), political system and international issues as well as social and economic systems (demography, ethnic, regional, gender and equality issues, trade, industry, science and technology).	
Modes of Study	22 h lectures in English. The course is divided in following parts: A) History (4 lectures) B) Culture (4 lectures) C) Lifestyle (4 lectures) D) Architecture and Built Environment (2 lectures) E) Society (2 lectures) F) Economic Systems (2 lectures) F) Nature and Landscape (4 lectures) G) Exam (2 lectures)	
Evaluation	Pass/fail on the basis of participation 60% and a written examination 40%.	
Study materials	Portraying Finland. Facts and Insights. Otava 2005. (Available in the library)	

8 Language Centre Courses 2009–2010

The LUT Language Centre offers courses in eight languages: Finnish, English, German, Spanish, French, Russian, Chinese and Swedish. A number of courses in Finnish, English, German, Spanish, French, Russian and Chinese do not require Finnish skills from participants and are available to international students. The language of instruction is mentioned in the course descriptions.

You must register for language courses before they begin. The number of participants for the language groups is limited, and teachers will decide on admissions based on certain criteria. The order in which students register, is not a criterion for admission.

You can register for courses through WebOodi. The registration periods of Language Centre courses differ slightly from those of the faculties because of the student admission process. Please check the registration periods on the Language Centre web site at www.lut.fi/kike. Students will be informed of admissions by e-mail. Please make sure that your e-mail address in WebOodi is correct.

Remember to register for courses and exams separately.

	<i>ECTS cr</i>
FV11A1000 English for Marketing	3
FV11A2201 Technical English Reading Course	2
FV11A2600 Business English Reading Course	2
FV11A3200 Information Technology	2
FV11A4200 Writing for Business	2
FV11A4600 Energy Issues	3
FV11A4900 Financial English	2
FV11A5800 Aspects of Work	3
FV11A6201 English for Meetings and Discussions	3
FV11A6500 Presenting in English	2
FV11A7400 Technology and the Environment	3
FV11A8500 Machines and Processes	3
FV11A8900 Academic Writing in English	4
FV11A9100 Going International and Intercultural Communication	3
FV11A9200 Technical and Current Issues	2
FV11A9501 Directed Independent Study	2
FV12A1210 Basic Course in German 1	2
FV12A1220 Basic Course in German 2	2
FV12A1230 Basic Courses in German 1 + 2 (intensive)	4
FV12A1410 Intermediate Course in German 1	2
FV12A1420 Intermediate Course in German 2	2
FV12A1430 Intermediate Courses in German 1 + 2 (intensive)	4
FV12A1610 German for Working Life 1	2
FV12A1620 German for Working Life 2	2
FV12A1630 German for Working Life 1 + 2 (intensive)	4
FV12A2000 Activation of German Skills	2
FV12A2500 Suggestopedic German Course	2
FV12A3300 Information on Germany	2
FV12A3400 Oral Communication in German: Working on a Project	2
FV12A4400 German for Mechanical Engineering	2
FV12A4600 German for Energy Technology	2
FV12A5201 German Independent Study	1 - 2
FV12A5400 German Self Study Course on Economics	2
FV12A6201 Listening Comprehension in German	2
FV12A6600 Getting to Know Austria and Switzerland	2
FV12A7110 Business German 1 - Personnel Management	2
FV12A7120 Business German 2 - Marketing	2
FV12A7130 Business German 3 - Enterprises	2

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FV12A7140	Business German 4 - Economy	2
FV12A7200	Finnish Industry in German	2
FV14A3001	Russian Intensive Course in St. Petersburg	3
FV14A7001	Russian Independent Study Course	2 - 5
FV15A1210	Basic Course in French 1	2
FV15A1220	Basic Course in French 2	2
FV15A1410	Intermediate Course in French 1	2
FV15A1420	Intermediate Course in French 2	2
FV15A1500	French Pronunciation	2
FV15A1610	French for Working Life 1	2
FV15A1620	French for Working Life 2	2
FV15A4000	Suggestopedic French Course	2
FV15A5010	Business French 1	2
FV15A5020	Business French 2	2
FV15A6001	Intercultural course in French	3
FV15A9301	French Independent Study	1 - 4
FV16A1210	Basic Course in Spanish 1	2
FV16A1220	Basic Course in Spanish 2	2
FV16A1251	Essential Spanish Vocabulary	1
FV16A1410	Intermediate Course in Spanish 1	2
FV16A1420	Intermediate Course in Spanish 2	2
FV16A1601	Spanish for Working Life	2
FV16A1701	Understanding Spanish Around the World	2 - 3
FV16A2202	Facts about Spain	3
FV16A3201	Business Spanish	3
FV16A5201	Intercultural Spanish Course	3
FV18A9101	Finnish 1	2
FV18A9201	Finnish 2	2
FV18A9301	Finnish 3	2
FV18A9820	Learning Together - Conversation and Culture in French and Finnish	1
FV19A1000	Chinese 1	3
FV19A2000	Chinese 2	3
FV19A3001	Chinese for Working Life	3
FV19A5000	Chinese for Oral Communication	3

<i>FV11A1000</i>	<i>ENGLISH FOR MARKETING</i>	<i>3 ECTS cr</i>
	English for Marketing	
Year and Period	Period 1–2, 3–4	
Teacher(s)	Lecturer, Riitta Gröhn	
CEF Level	Student entry level: B2 level according to the Common European Framework.	
Aims	By the end of the course, students are expected to: <ul style="list-style-type: none"> • have developed their oral, listening and writing skills • be able to use English in more specific scenarios such as negotiations, presentations and customer service, • have expanded their marketing vocabulary. 	
Content	Through role plays, case studies and small group work, students will work towards increasing their oral fluency, written accuracy and active listening ability. Students will also have the opportunity for autonomous study through the group project and self-study exercises meant to help students prepare for discussions and exercises.	
Modes of Study	The language of instruction is English. 48 contact lessons, with at least 30 hours required for homework and self-study. 1st–2nd period: groups A and B 3rd–4th period: group C This class is oriented towards students in business and marketing and they will be given priority. If there are spaces available, students from other disciplines will be welcome.	
Evaluation	Pass/Fail. Student marks will be determined through continuous assessment as well as self-assessment. Students who are not eligible for continuous assessment but have finished all of the assignments are able to sit the final exam, which is made up of a speaking, listening and writing component.	
Study materials	Materials will be provided by the teacher.	
Prerequisites	B2 level according to the Common European Framework. Students should assess their level of English before the course using an online diagnostic tool called Dialang. It can be found at www.dialang.org . Students at levels of B1 and lower should consider independent language work to improve their level to the point that they can participate in the course (B2).	
<i>FV11A2201</i>	<i>TECHNICAL ENGLISH READING COURSE</i>	<i>2 ECTS cr</i>
	Technical English Reading Course	
Year and Period	B.Sc. (Tech.) 1-3, M.Sc. (Tech.) 1, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Jukka Taipale	
CEF Level	The course will be taught at a B2/B2+ level according to the Common European Framework.	
Aims	By the end of the course, students are expected to be able to demonstrate: <ul style="list-style-type: none"> - the ability to learn and master general technical vocabulary - the ability to read quickly and effectively. 	
Content	Vocabulary exercises, skimming, scanning and affixes, reading comprehension exercises, individual, pair or group work.	
Modes of Study	The language of instruction: English. 28 contact lessons, with 24 hours required for homework and self-study. 1st period: group A 2nd period: group B 3rd period: group C 4th period: group D.	
Evaluation	Marks are based on a reading comprehension test (duration 90 minutes). Fail / Pass with distinction. Students are expected to attend classes regularly, take an active part in classes and complete all assignments. All assignments must be completed to be eligible to sit the exam.	

Study materials	Provided by the teacher.	
Prerequisites	Students with a matriculation exam grade of A, B, C or a short course in English may enroll for the course. Students who have taken Technical English Reading Course 1, Technical English Reading Course 2 or the Business English Reading Course are not eligible for this course.	
FV11A2600	BUSINESS ENGLISH READING COURSE	2 ECTS cr
	Business English Reading Course	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Jukka Taipale	
CEF Level	The course will be taught at B2/B2+ level according to the Common European Framework.	
Aims	By the end of the course, students are expected to be able to demonstrate: - the ability to learn and master general business vocabulary - the ability to read quickly and effectively.	
Content	Vocabulary exercises, skimming, scanning and affixes, reading comprehension exercises, individual, pair or group work. The languages of instruction is English.	
Modes of Study	28 contact lessonss, with 24 hours required for homework and self-study. 1st period: group A 2nd period: groups B and C 3rd period: group D 4th period: group E Intensive course in May 2010: group F.	
Evaluation	Marks are based on a reading comprehension test (duration 90 minutes). Fail–Pass with distinction. Students are expected to attend classes regularly, take an active part in classes and complete all assignments. All assignments must be completed to be eligible to sit the exam.	
Study materials	Provided by the teacher.	
Prerequisites	Students who have taken Technical English Reading Course 1 or Technical English Reading Course 2 or FV11A2201 Technical English Reading Course are not eligible for this course.	
FV11A3200	INFORMATION TECHNOLOGY	2 ECTS cr
	Information Technology	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Jukka Taipale	
CEF Level	The course will be taught at a B2/B2+ level according to the Common European Framework.	
Aims	By the end of the course, students are expected to be able to demonstrate: - the ability to learn and master the language needed to read and talk about issues connected with information technology. - skills required to follow lectures given in English.	
Content	The Internet / World Wide Web / Video will be used as a resource. A wide variety of teaching methods will be used, including exercises based on reading, writing, speaking and listening skills. The language of instruction is English.	
Modes of Study	28 contact hours, with 24 hours required for homework and self-study. 1st period: group A 2nd period: group B 3rd period: group C 4th period: group D. Continuous assessment of the student's participation in class, resulting in an oral mark, and written exercises approved by the teacher.	
Evaluation	Fail–Pass with distinction. Students are expected to attend classes regularly, take an active part in classes and complete all assignments.	

Study materials	All assignments must be completed to be eligible to be assessed. Oral mark 50%, written exercises 50%. Provided by the teacher and the students.
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FV11A4200	WRITING FOR BUSINESS	2 ECTS cr
	Writing for Business	
Year and Period	B.Sc. (Tech.) 1-3, B.Sc. (Econ. & Bus. Adm.) 1-3, Period 1, 3, 4	
Teacher(s)	Lecturer, Paula Haapanen Lecturer, Riitta Gröhn	
CEF Level	B2 and above	
Aims	By the end of the course, students are expected to be able to: <ul style="list-style-type: none"> • use stock phrases and functional language to help them correspond in a number of professional situations in different registers. • differentiate between formal and informal business correspondence. • find sources of reference in connection with writing. • critically read and constructively comment on other students' work through peer review. 	
Content	Using a variety of sources and scenarios, and with guidance from the teacher, students will help each other to learn how to deal with a wide range of business correspondence: from requests and complaints to internal memos and reports. The language of instruction is English.	
Modes of Study	This class is based on Web Enhanced Language Learning. The course will mainly use the Blackboard platform so that students can share ideas, critique each other's work and receive feedback from the teacher in pairs. Students will have 4 hours of contact and 48 hours of individual study, virtual group work and peer evaluation. 1st period: groups A and B 3rd period: groups C, D and E 4th period: group F and G. Students of all disciplines are welcome.	
Evaluation	The marks are based on assignments and a joint portfolio done with your partner. Pass/Fail. Students will be assessed at the B2 level.	
Study materials	There is no specific book requirement. However, students are advised to obtain Andrew Littlejohn's book <i>Company to Company</i> .	
Prerequisites	Students with a writing skill level of B1 or lower should consider independent language work to work on basic writing skills and to improve their level to the point that they can participate on the course. Writing levels can be assessed using Dialang (www.dialang.org).	

FV11A4600	ENERGY ISSUES	3 ECTS cr
	Energy Issues	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 3–4	
Teacher(s)	Lecturer, Peter G. Jones	
CEF Level	B2 and above	
Aims	To develop and maintain speaking, listening and reading skills based on the theme of energy. On completion of the course, students will be able to read and understand written texts about energy issues, understand spoken texts about energy issues, and discuss topical energy issues with a degree of fluency permitting active participation in study and work related to the field of energy technology.	
Content	Language practice and exercises based on texts, both written and spoken, concerning various topical energy issues – ranging from technological challenges to economic and environmental considerations. Language of instruction: English.	

Modes of Study	Contact hours: 48 (24+24) Homework 30+ Periods 3–4: Groups A and B.
Evaluation	Written test and continuous assessment/oral test. 0–5, written test (50%), continuous assessment/oral test (50%). Students must successfully complete all course assignments to be eligible for the examination.
Study materials	Provided by the teacher.

<i>FV11A4900</i>	<i>FINANCIAL ENGLISH</i>	<i>2 ECTS cr</i>
	Financial English	
Year and Period	Period 1, 2	
Teacher(s)	Lecturer, Peter G. Jones	
CEF Level	B2 and above	
Aims	To improve English skills in the field of economics and finance. On completion of the course, students will be able to read and understand written texts about economics and finance quickly and effectively and will have an adequate mastery of basic terminology from the field, thus permitting active participation in study and work related to the area.	
Content	Texts and tasks from the field of economics and finance, for example, taxation, investment, macroeconomics, ethics etc.	
Modes of Study	Language of instruction: English. Contact hours: 24 Homework: 25+ Minimum attendance requirement: 75%. Period 1: Groups A and B Period 2: Groups C and D.	
Evaluation	Written test. 0–5, written test (100%). Students must successfully complete all course assignments to be eligible for the examination.	
Study materials	Provided by the teacher.	

<i>FV11A5800</i>	<i>ASPECTS OF WORK</i>	<i>3 ECTS cr</i>
	Aspects of Work	
Year and Period	Period 1–2, 3–4	
Teacher(s)	Lecturer, Hwei-Ming Boey	
CEF Level	B2 and above	
Aims	<ul style="list-style-type: none"> • To develop the student's speaking, listening and reading skills • To discuss various types of CVs and letters of application By the end of the course students will be able to <ul style="list-style-type: none"> • communicate (with varying degrees of competence) about issues dealt with during the course • use the communication skills developed in circumstances outside of class • differentiate between various types of CVs and letters of application. 	
Content	Issues concerning work.	
Modes of Study	Language of instruction: English. 48 contact hours + 30 hours independent study 1st–2nd period: groups A and B 3rd–4th period: groups C and D Tests: 1) A reading comprehension and writing test 2) An oral expression test 3) A conversation test (Students may be exempted from the oral expression and conversation tests if they actively participate in at least 75% of the lessons.)	
Evaluation	Pass With Distinction/Pass/Fail.	
Study materials	Provided by the teacher.	

FV11A6201	ENGLISH FOR MEETINGS AND DISCUSSIONS 3 ECTS cr
	English for Meetings and Discussions
Year and Period	Period 3–4
Teacher(s)	Lecturer, Hwei-Ming Boey
CEF Level	B2 and above
Aims	To practise the language needed for participating in all kinds of meetings and discussions (ranging from social and business events, to negotiations, panel discussions and conferences). By the end of the course, students will be able to communicate more fluently in all kinds of meetings and discussions.
Content	Discussion and practice of the language for effective oral communication, participation in simulations of meetings. Language of instruction: English. Students who have taken FV11A6200 English for Negotiating are not eligible for this course.
Modes of Study	48 contact hours + 30 hours independent study. Group A: Intensive course in October on weeks 43–44 Group B: Intensive course in January on weeks 1–2 Note: If not enough students sign up for the intensive groups, then they will be taught regularly, from periods 3 to 4, 4 hours/week. Continuous assessment. Regular attendance required.
Evaluation	Pass With Distinction/Pass/Fail
Study materials	Provided by the teacher.

FV11A6500	PRESENTING IN ENGLISH	2 ECTS cr
	Presenting in English	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Peter G. Jones	
CEF Level	B2 and above	
Aims	To improve the ability to construct and deliver oral presentations in English. By the end of the course, students will be able to deliver carefully constructed, clear and effective presentations for academic and professional purposes.	
Content	The language of presentations: - Starting a presentation, controlling the flow, the language of diagrams, summing up, handling questions etc. - Establishing and maintaining contact with the audience. - Delivering presentations in a supportive context. - Analysing one's own performance and establishing areas in need of further development.	
Modes of Study	Language of instruction: English. Contact lessons: 24 Homework: 25+ Period 1: Groups A and B Period 2: Groups C and D Period 3: Group E Period 4: Group F. Classroom exercises, presentation practice, and homework. Minimum attendance requirement: 75%.	
Evaluation	Pass/Fail. Evaluated presentation (100%).	
Study materials	Provided by the teacher.	

FV11A7400	TECHNOLOGY AND THE ENVIRONMENT	3 ECTS cr
	Technology and the Environment	
Year and Period	Period 1–2	
Teacher(s)	Lecturer, Hwei-Ming Boey	
CEF Level	B2 and above	
Aims	To develop the student's speaking, listening and reading skills. By the end of the course, students will be able to: <ul style="list-style-type: none"> • communicate (with varying degrees of competence) about issues dealt with in the course • use the language skills developed in instances of communication beyond the classroom. 	
Content	Issues concerning the environment.	
	Language of instruction: English.	
Modes of Study	48 contact hours + 30 hours independent study 1st–2nd period: Groups A and B. 1) A listening comprehension test 2) An oral expression test 3) A conversation test (Students may be exempted from the oral expression and conversation tests if they actively participate in at least 75% of the lessons.)	
Evaluation	Pass With Distinction/Pass/Fail	
Study materials	Provided by the teacher.	
FV11A8500	MACHINES AND PROCESSES	3 ECTS cr
	Machines and Processes	
Year and Period	B.Sc. (Tech.) 1-3, Period 1–2, 3–4	
Teacher(s)	Lecturer, Paula Haapanen	
CEF Level	B2–C1	
Aims	By the end of the course, the student is expected to be able: <ul style="list-style-type: none"> • to give a technical description of a machine in his/her own professional field/field of study in some detail. • to present common processes and operations related to his/her own professional field/field of study • to discuss issues common to all fields of engineering. 	
Content	Using technically-oriented materials, students will mainly work on oral communication skills, active listening skills and some summary writing skills.	
Modes of Study	Three groups will be organized for the academic year: Periods 1 and 2: group A Periods 3 and 4: groups B and C The overall working time for the course is 78 hours and it will be divided up into various modes of study, including contact, online and independent work. This class is for students in engineering. If there are spaces available, students from other disciplines are welcome.	
Evaluation	Fail–Pass with Distinction will be determined through continuous assessment. Students who do not participate enough to qualify for continuous assessment but complete all of the assignments will be eligible to sit the final exam, which is made up of a speaking (50%), listening (25%) and writing (25%) component.	
Study materials	Materials will be provided by the students and the teacher.	
Prerequisites	B2 level according to the Common European Framework. Students are also expected to know the following before coming to class: <ul style="list-style-type: none"> • the names of basic shapes and their adjective forms, • how to read numbers and decimals in English. Self-study materials are available online and in the self-access room (1410B) for review.	

<i>FV11A8900</i>	<i>ACADEMIC WRITING IN ENGLISH</i>	<i>4 ECTS cr</i>
	Academic Writing in English	
Year and Period	B.Sc. (Tech.) 3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1–2, 3–4	
Teacher(s)	Lecturer, Paula Haapanen Lecturer, Peter G. Jones Lecturer, Riitta Gröhn Part-time Untenured Teacher, Timothy Fowler	
CEF Level	B2–C1	
Aims	At the end of the course, the student is expected to be able to: <ul style="list-style-type: none"> • Identify the characteristics of academic writing in her/his field • Demonstrate research skills • Write an academic paper meeting academic conventions in her/his field • Give a presentation of the academic text produced for the course. 	
Content	Students will study features of English for academic and scientific writing, after which they will be responsible for producing a paper. The paper will be presented either as part of another course or in seminar presentation sessions organized for this course. Language of instruction: English.	
Modes of Study	Students who have taken the course FV11A5200 English for Academic Seminars, FV11A9151 English for Writing Bachelor's Thesis or FV11A9000 Academic Seminar for International Programs are not eligible for this course. The course is made up of 104 hours of work, which will be delivered using multiple modes of study including contact, online and individual work. 1st–2nd period: groups A and B 3rd–4th period: groups C, D and E	
Evaluation	Pass/fail.	
Study materials	There will be various sources of information used, including books, the Internet, magazines etc. as well as handouts provided by the teacher.	
<i>FV11A9100</i>	<i>GOING INTERNATIONAL AND INTERCULTURAL COMMUNICATION</i>	<i>3 ECTS cr</i>
	Going International and Intercultural Communication	
Year and Period	Period 1–2, 3–4	
Teacher(s)	Part-time Untenured Teacher, Timothy Fowler	
CEF Level	Teaching level: C2; language will not be taught and students will gain in fluency at B2/C1 levels.	
Aims	By the end of the course, students will be expected: <ul style="list-style-type: none"> • to demonstrate understanding of the concept of culture and how it is learned. • to explain the iceberg analogy of culture in contrast to other analogies of culture. • to demonstrate an ability to use the DIE observation skills model, e.g. with pictures. • to show they can work effectively in small groups. • to show they can risk new behaviour by sharing in large groups. • to explain cultural learning in areas like ideas, sentiments, values, etc by using Finland as an example. • to explain the basic principle of culture related to semiotics. • to put oneself on the Milton Bennett model of intercultural sensitivity chart. 	
Content	Through the principles of experiential learning and general interculturalist theories, students will analyze their own cultures, practise observation of culture by using Finnish situations as examples, and learn more about self as a cultural being. Students will write response papers both individually and in groups regarding different aspects of the course to show a grasp of the principles and self-awareness.	
Modes of Study	48 h contact lessons, 30 hours independent study and homework. Periods 1–2: Groups A and B	

	<p>Periods 3–4: Group C</p> <p>NOTE: Although ECTS credits are given to fulfill language requirements, the course is a content course studying culture and not a language course studying language. The language of instruction and all student activities is English, and many activities will involve students in activities outside classroom.</p> <p>Students (with a level of at least B2) from all departments are welcome. Preference will be given to students applying to student exchange or planning to work abroad.</p> <p>Since experiential learning techniques are important for the course, do not take this course if you plan a lengthy vacation during the class period. Any absence lasting longer than three consecutive class meetings will require additional work on the part of the student.</p>
Evaluation	Pass/Fail
Study materials	No required book; handouts will be given and Internet sources used.

<i>FV11A9200</i>	<i>TECHNICAL AND CURRENT ISSUES</i>	<i>2 ECTS cr</i>
	Technical and Current Issues	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Jukka Taipale Part-time Untenured Teacher, Timothy Fowler	
CEF Level	Level coming into the course: C1.	
Aims	By the end of the course, students are expected to be able to demonstrate: <ul style="list-style-type: none"> - an increase in fluency in spoken English, - an increased ability to understand spoken discourse on technical, business and general issues covered during the course. 	
Content	Language practice and exercises based on audio and video material from a variety of sources concerning topics of interest, both technical and general. Language of instruction: English.	
Modes of Study	Contact hours: 26 Homework: 25+ 1st period: Group A 2nd period: Group B 3rd period: Group C 4th period: Group D.	
Evaluation	Listening comprehension test. Continuous assessment/speaking test. Fail–Pass with distinction. Students are expected to attend classes regularly, take an active part in classes and complete all assignments. All assignments must be completed to be eligible to sit the exam. listening comprehension test (50%), continuous assessment/speaking test (50%).	
Study materials	Provided by the teacher.	
Prerequisites	Students' spoken ability should be at a C1 level.	

<i>FV11A9501</i>	<i>DIRECTED INDEPENDENT STUDY</i>	<i>2 ECTS cr</i>
	Directed Independent Study	
Year and Period	B.Sc. (Tech.) 3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1–2, 3–4	
Teacher(s)	Lecturer, Paula Haapanen Lecturer, Riitta Gröhn Part-time Untenured Teacher, Timothy Fowler	
CEF Level	Dependent on the needs of individual students.	
Aims	To enable students to develop language skills specific to their individual needs. By the end of this course, students are expected to: <ul style="list-style-type: none"> • show an improvement in independent study skills. • show improvement in the linguistic areas set out in their learning plans. • be able to critically reflect on learning experiences in order to continue learning and working towards linguistic goals. 	

Content	<ul style="list-style-type: none"> • be able to show a record of learning experiences carried out according to an autonomous learning plan. Students follow a programme of language studies set out by the teacher. Language of instruction: English.
Modes of Study	Students first enrol using WebOodi. When the enrolment period has ended, the students selected to the course will be contacted regarding an initial information meeting. Students will receive individual tutoring sessions with the lecturer of approximately 30 minutes each. 1st–2nd period: groups A and B 3rd–4th period: groups C and D.
Evaluation	Pass/Fail.
Prerequisites	Students must be able to show that they are well-prepared for the course and can work independently in a productive manner. Please note that enrolment is limited. All students should write detailed reasons about why they should be chosen for this course when they apply. Use the section marked "Lisätietoja/Additional Information" in the WebOodi application.

<i>FV12A1210</i>	<i>BASIC COURSE IN GERMAN 1</i>	<i>2 ECTS cr</i>
	Saksan peruskurssi 1	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Pirjo Rantonen Lecturer, Jörg Wunderlich	
CEF Level	A1.1	
Aims	By the end of the course, students are expected <ul style="list-style-type: none"> • to understand spoken language when it is slow, clear and related to topics discussed during the course • to use simple sentences to talk about topics of the course • to write short and simple texts related to topics discussed during the course • to use polite phrases and expressions typical of the German communication culture. 	
Content	Situations: personal data, introducing oneself, times and days of the week, food, using public transport. Structures: verbs in the present tense, negation, word order, use of articles, accusative, numerals, personal pronouns. Languages of instruction: German and Finnish.	
Modes of Study	Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. 1st period: group A 2nd period: group B 3rd period: group C 4th period: group D Written examination. Oral test or grade based on continuous assessment. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade. Students who have passed the course FV12A1200 German 1 are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/fail.	
Study materials	Alltag, Beruf & Co. 1, chapters 1–5.	

<i>FV12A1220</i>	<i>BASIC COURSE IN GERMAN 2</i>	<i>2 ECTS cr</i>
	Saksan peruskurssi 2	
Year and Period	Period 2, 3, 4	
Teacher(s)	Lecturer, Pirjo Rantonen Lecturer, Jörg Wunderlich	
CEF Level	A1.1	
Aims	By the end of the course, students are expected	

Content	<ul style="list-style-type: none"> • to understand spoken language when it is slow, clear and related to topics discussed during the course • to use simple sentences to talk about topics of the course • to write short and simple texts related to topics discussed during the course • to use polite phrases and expressions typical of the German communication culture. <p>Situations: making purchases and placing orders, giving directions, agreeing on schedules, family, greetings.</p> <p>Structures: modal verbs, ordinals, accusative and dative use of personal pronouns, possessive pronouns, imperative.</p>
Modes of Study	<p>Languages of instruction: German and Finnish.</p> <p>Exercises that support communication skills.</p> <p>Contact hours 28, independent study approx. 24 hours.</p> <p>2nd period: group A 3rd period: group B 4th period: group C</p> <p>Written examination. Oral test or grade based on continuous assessment.</p> <p>Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade.</p> <p>Students who have passed the course FV12A1200 German 1 are not eligible for this course because of the similar contents of the courses.</p>
Evaluation	Pass/fail.
Study materials	Alltag, Beruf & Co. 1, chapters 6–10.
Prerequisites	FV12A1210 Basic Cours in German 1 or corresponding skills.

FV12A1230	BASIC COURSES IN GERMAN 1 + 2 (INTENSIVE)	4 ECTS cr
Year and Period	Saksan peruskurssit 1 + 2 (intensiivi)	
Teacher(s)	Period 1–2 Lecturer, Pirjo Rantonen	
CEF Level	A1.1	
Aims	By the end of the course, students are expected	
Content	<ul style="list-style-type: none"> • to understand spoken language when it is slow, clear and related to topics discussed during the course • to use simple sentences to talk about topics of the course • to write short and simple texts related to topics discussed during the course • to use polite phrases and expressions typical of the German communication culture. <p>Situations: personal data, introducing oneself, times and days of the week, food, using public transport, making purchases and placing orders, giving instructions, agreeing on schedules, family, greetings.</p> <p>Structures: verbs in the present tense, negation, word order, use of articles, accusative, numerals, personal pronouns, modal verbs, ordinals, accusative and dative use of personal pronouns, possessive pronouns, imperative.</p>	
Modes of Study	<p>Languages of instruction: German and Finnish.</p> <p>Exercises that support communication skills.</p> <p>Contact hours 56, independent study approx. 48 hours. Intensive instruction on Fridays and Saturdays.</p> <p>1st–2nd periods: 1 group</p> <p>Written examination. Oral test or grade based on continuous assessment.</p> <p>Students who have passed the course FV12A1200 German 1 are not eligible for this course because of the similar contents of the courses.</p>	
Evaluation	Pass/fail.	
Study materials	Alltag, Beruf & Co. 1, chapters 1–10.	

<i>FV12A1410</i>	<i>INTERMEDIATE COURSE IN GERMAN 1</i>	<i>2 ECTS cr</i>
	Saksan jatkokurssi 1	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Pirjo Rantonen Lecturer, Karita Riekkö Lecturer, Theodor Steidel	
CEF Level	A1.2.	
Aims	By the end of the course, students are expected <ul style="list-style-type: none"> • to be able to discuss topics introduced during the course • to be able to write short texts on topics discussed during the course • to understand the main idea of texts on topics discussed during the course • to understand and apply the most important German customs. 	
Content	Situations: Course book Fahrplan: living, place of residence, on the phone. Course book Alltag, Beruf & Co. 2: describing oneself, organisation of travels and meetings, talking about health. Structures: Course book Fahrplan: dative, possessive pronouns, prepositions, imperative, ordinals. Course book Alltag, Beruf & Co. 2: imperative, separable verbs, perfect tense, sein and haben in the past tense. Languages of instruction: German and Finnish.	
Modes of Study	Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. 1st period: group A (course book Fahrplan) 2nd period: group B (course book Fahrplan) 3rd period: group C (Course book Alltag, Beruf & Co. 2) 4th period: group D (Course book Alltag, Beruf & Co. 2). Written examination. Oral test or grade based on continuous assessment. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade. Students who have passed the course FV12A1400 German 2 are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/fail.	
Study materials	Fahrplan - teksti ja sanastot & Fahrplan - kielioppi ja harjoitukset, chapters 8–11 OR Alltag, Beruf & Co. 2, chapters 1–5.	
Prerequisites	FV12A1220 Basic Course in German 2, FV12A1200 German 1 or equivalent skills.	

<i>FV12A1420</i>	<i>INTERMEDIATE COURSE IN GERMAN 2</i>	<i>2 ECTS cr</i>
	Saksan jatkokurssi 2	
Year and Period	Period 2, 3, 4	
Teacher(s)	Lecturer, Pirjo Rantonen Lecturer, Karita Riekkö	
CEF Level	A1.2	
Aims	By the end of the course, students are expected <ul style="list-style-type: none"> • to be able to discuss topics introduced during the course • to be able to write short texts on topics discussed during the course • to understand the main idea of texts on topics discussed during the course • to understand and apply the most important German customs. 	
Content	Situations: Course book Fahrplan: hotel room reservation, travelling, presenting a company. Course book Alltag, Beruf & Co. 2: home and decorating, situations on the phone, informal meetings, small talk.	

Modes of Study	Structures: Course book Fahrplan: subordinate clauses, sein and haben in the past tense, perfect tense. Course book Alltag, Beruf & Co. 2: two-way prepositions, subordinate clauses, adjective endings, possessive pronouns. Languages of instruction: German and Finnish. Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. 2nd period: group A (course book Fahrplan) 3rd period: group B (course book Fahrplan) 4th period: group C (course book Alltag, Beruf & Co. 2). Written examination. Oral test or grade based on continuous assessment. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade. Students who have passed the course FV12A1400 German 2 are not eligible for this course because of the similar contents of the courses.
Evaluation	Pass/fail.
Study materials	Fahrplan - tekstit ja sanastot & Fahrplan - kielioppi ja harjoitukset, chapters 12–14 OR Alltag, Beruf & Co. 2, chapters 6–10.
Prerequisites	FV12A1410 Intermediate Course in German 1 or equivalent skills.

FV12A1430	INTERMEDIATE COURSES IN GERMAN 1 + 2 4 ECTS cr (INTENSIVE)
Year and Period	Saksan jatkokurssit 1 + 2 (intensiivi) Period 4
Teacher(s)	Lecturer, Karita Riekkö
CEF Level	A1.2
Aims	By the end of the course, students are expected <ul style="list-style-type: none"> • to be able to discuss topics introduced during the course • to be able to write short texts on topics discussed during the course • to understand the main idea of texts on topics discussed during the course • to understand and apply the most important German customs.
Content	Situations: describing oneself, organisation of travel and meetings, talking about health, home and decorating, situations on the phone, informal meetings, small talk. Structures: imperative, separable verbs, perfect tense, sein and haben in the past tense, two-way prepositions, subordinate clauses, adjective endings, possessive pronouns. Languages of instruction: German and Finnish. Exercises that support communication skills.
Modes of Study	Contact hours 56, independent study approx. 48 hours. Intensive course on Fridays and Saturdays. 4th period: 1 group Written examination. Oral test or grade based on continuous assessment. Students who have passed the course FV12A1400 German 2 are not eligible for this course because of the similar contents of the courses.
Evaluation	pass/fail
Study materials	Alltag, Beruf & Co. 2, chapters 1–10.
Prerequisites	FV12A1220 Basic Course in German 2, FV12A1200 German 1 or equivalent skills.

FV12A1610	GERMAN FOR WORKING LIFE 1 2 ECTS cr
Year and Period	Työelämän saksaa 1 Period 1, 3
Teacher(s)	Lecturer, Pirjo Rantonen Lecturer, Karita Riekkö
CEF Level	A2.1.

Aims	By the end of the course, students are expected to be able <ul style="list-style-type: none"> • to talk about themselves as employees • to talk about their day at work • to write a simple job application and CV • to understand the main points of general texts on the world of work • to compare the work cultures of Finland and Germany
Content	Situations: the working day, applying for a job, visiting a company, purchases and sales. Structures: reflexive verbs, the past tense, the infinitive, the genitive and conjugation forms of adjectives. Languages of instruction: German and Finnish.
Modes of Study	Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. 1st period: groups A and B 3rd period: groups C and D Written examination. Oral test or grade based on continuous assessment. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade. Students who have passed the course FV12A1600 German for Working Life are not eligible for this course because of the similar contents of the courses.
Evaluation	Pass/fail.
Study materials	Fahrplan 2, chapters 1–5.
Prerequisites	FV12A1420 Intermediate Course in German 2 or equivalent skills.

FV12A1620	GERMAN FOR WORKING LIFE 2	2 ECTS cr
	Työelämän saksaa 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, Pirjo Rantonen Lecturer, Karita Riekkö	
CEF Level	A2.1	
Aims	By the end of the course, students are expected to be able <ul style="list-style-type: none"> • to talk about their work, employer and working environment • to understand the main points of general texts on the world of work • to compare the working cultures of Finland and Germany. 	
Content	Situations: employer and working environment, equipment, encountering different cultures, small talk. Structures: the comparative forms of adjectives, relative pronouns, passive, conditional. Languages of instruction: German and Finnish.	
Modes of Study	Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. 2nd period: groups A and B 4th period: group C Written examination. Oral test or grade based on continuous assessment. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade. Students who have passed the course FV12A1600 German for Working Life are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/fail.	
Study materials	Fahrplan 2, chapters 6–10.	
Prerequisites	FV12A1610 German for Working Life 1 or equivalent skills.	

FV12A1630	GERMAN FOR WORKING LIFE 1 + 2 (INTENSIVE)	4 ECTS cr
	Työelämän saksaa 1 + 2 (intensiivi)	
Year and Period	Period 5	
Teacher(s)	Lecturer, Karita Riekkö	

CEF Level	A2.1
Aims	By the end of the course, students are expected to be able <ul style="list-style-type: none"> • to talk about themselves as employees • to talk about their work, their day at work, employer and working environment • to write a simplified job application and CV • to understand the main points of general texts on the world of work • to compare the work cultures of Finland and Germany.
Content	Situations: the working day, applying for a job, the employer and working environment, visiting a company, purchases and sales, equipment, encountering different cultures, small talk. Structures: reflexive verbs, the past tense, the infinitive, the genitive, the conjugation and comparative forms of adjectives, relative pronouns, passive, conditional.
Modes of Study	Languages of instruction: German and Finnish. Exercises that support communication skills. Contact lessons 56, independent study approx. 48 hours. Intensive course in May on Fridays and Saturdays. 5th period: 1 group. Written examination. Oral test or grade based on continuous assessment. Students who have passed the course FV12A1600 German for Working Life are not eligible for this course because of the similar contents of the courses.
Evaluation	Pass/fail.
Study materials	Fahrplan 2, chapters 1–10.
Prerequisites	FV12A1420 Intermediate Course in German 2 or equivalent skills.

FV12A2000	ACTIVATION OF GERMAN SKILLS	2 ECTS cr
	Saksan kielitaidon aktivointi	
Year and Period	Period 1, 2, 4	
Teacher(s)	Lecturer, Theodor Steidel	
CEF Level	Entry level: A2.1	
Aims	By the end of the course, students are expected: <ul style="list-style-type: none"> - to know the basic German grammar - to be able to write texts at the proficiency level in question - to be able to have everyday discussions in German. 	
Content	Contact lessons: revision of grammar, spoken exercises, pair work, writing assignments. Homework: grammar exercises.	
Modes of Study	Languages of instruction: German and Finnish. Contact lessons 28, independent work approx. 24 hours. 1st period: Group A 2nd period: Group B 4th period: Group C Active participation and successfully completed exercises or a written and oral test. Continuous assessment requires 75% attendance.	
Evaluation	Pass/fail.	
Study materials	Materials provided by the teacher.	
Prerequisites	Approx. two years of German studies.	

FV12A2500	SUGGESTOPEDIC GERMAN COURSE	2 ECTS cr
	Suggestopedinen saksa	
Year and Period	Period 3	
Teacher(s)	Lecturer, Pirjo Rantonen	
CEF Level	A2/B1	
Aims	By the end of the course students will be expected to: <ul style="list-style-type: none"> - be able to communicate orally in varying and even unexpected situations using standard language 	

Content	- understand standard spoken language on varying topics - communicate orally more unreservedly and spontaneously than at the beginning of the course - be able to face new communication situations more boldly. Primarily everyday and work related situations familiar from the basic language courses, oral communication with the help of the suggestopedic method. Extended vocabulary related to these situations.
Modes of Study	Pair and group work, role play. Contact hours 28, independent work 16 hours. Learning journal. Weekend course. 3rd period: 1 group.
Evaluation	Continuous assessment requires full attendance and active participation (85% of the lessons). Pass/fail.
Study materials	Material provided by the teacher.
Prerequisites	Skills at the level A2.1.

FV12A3300	INFORMATION ON GERMANY	2 ECTS cr
	Info Deutschland	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Jörg Wunderlich Lecturer, Theodor Steidel	
CEF Level	Entry level: A2.	
Aims	By the end of the course, students are expected to be able - to recognise differences and similarities between the Finnish and German cultures - to use their oral skills in cooperation with German partners - to give presentations in German - to know the basic information on Germany.	
Content	Students prepare a short presentation on a topic related to the country, e.g. geography, culture, media, history, politics, sports, or climate. Discussions on cultural differences between Finland and Germany. Language of instruction: German.	
Modes of Study	Contact lessons 28, independent work approx. 24 hours. 1st period: group A: 2 x 2 hours/week 2nd period: group B: evening course, once a week, 4 hours on Mondays 3rd period: group C: 2 x 2 hours/week 4th period: group D: evening course, once a week, 4 hours on Mondays Pair and group assignments, role play. Active participation.	
Evaluation	Grade based on continuous assessment or an oral and written test. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV12A3200 Finnland als Partner are not eligible for this course because of the similar contents of the courses.	
Study materials	Pass/fail. Materials provided by the teacher and online material in the Blackboard learning environment.	
Prerequisites	Courses at the level A2.1 or equivalent skills.	

FV12A3400	ORAL COMMUNICATION IN GERMAN: WORKING ON A PROJECT	2 ECTS cr
	Mündliche Kommunikation: Projektarbeit	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Jörg Wunderlich Lecturer, Theodor Steidel	
CEF Level	Entry level: A2	
Aims	By the end of the course, students are expected to be able	

Content	<ul style="list-style-type: none"> - to use their oral skills in cooperation with German partners - to recognise differences and similarities between the Finnish and German cultures. <p>Students prepare an international project and practise their project-related communication skills (project planning, project meeting, invitation, communication on the phone, meeting programme, presenting tourist attractions, preparing informal meetings, restaurant and hotel situations). Discussions on cultural differences between Finland and Germany.</p>
Modes of Study	<p>Language of instruction: German.</p> <p>Contact hours 28, independent work approx. 24 hours.</p> <p>1st period: group A: 1x4 hours/week on Monday evenings 2nd period: group B: 2x2 hours/week 3rd period: group C: 1x4 hours/week on Monday evenings 4th period: group D: 2x2 hours/week May 2010: group E: intensive course.</p> <p>Pair and group assignments, role play. Active participation.</p>
Evaluation	<p>Grade based on continuous assessment or an oral and written test. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV12A3200 Finland als Partner are not eligible for this course because of the similar contents of the courses.</p>
Study materials	<p>Pass/fail.</p> <p>Materials provided by the teacher and online material in the Blackboard learning environment.</p>
Prerequisites	<p>Courses at the level A2.1 or equivalent skills.</p>

<i>FV12A4400</i>	<i>GERMAN FOR MECHANICAL ENGINEERING</i>	<i>2 ECTS cr</i>
	Deutsch im Maschinenbau	
Year and Period	Period 1	
Teacher(s)	Lecturer, Jörg Wunderlich	
CEF Level	Teaching level: B1	
Aims	<p>By the end of the course, students are expected</p> <ul style="list-style-type: none"> - to know basic terminology in the field - to be able to describe a technical process - to understand texts on mechanical engineering - to know grammar needed in technical language. 	
Content	<p>Revision of grammatical structures for technical language. Written and spoken description of technical procedures and processes. Exercises in spoken language once a week during contact lessons. Language of instruction: German.</p>	
Modes of Study	<p>Contact lessons 14, independent work (online) approx. 38 hours.</p> <p>1st period: 1 group.</p> <p>Continuous assessment requires 75% attendance and active participation. Successfully completed written and spoken assignments or written and oral test. Self-study possibility: written examination and oral test. Briefing in the beginning of the course.</p>	
Evaluation	<p>Pass/fail.</p>	
Study materials	<p>Online material and exercises: http://www.uni-tuebingen.de/ael/deuma/deuma_overview.htm</p>	
Prerequisites	<p>Courses at the level A2.2 or equivalent skills.</p>	

<i>FV12A4600</i>	<i>GERMAN FOR ENERGY TECHNOLOGY</i>	<i>2 ECTS cr</i>
	Energietechnik	
Year and Period	Period 2	
Teacher(s)	Lecturer, Jörg Wunderlich	
CEF Level	Teaching Level: A2.2	

Aims	By the end of the course, students are expected <ul style="list-style-type: none"> - to know basic terminology in the field - to know the grammatical structures needed in technical language - to be able to discuss energy issues - to be able to describe a process - to understand texts on energy technology - to be able to give a presentation in German.
Content	Revision of grammar needed in technical language. Spoken and written exercises on technical language. Topics include e.g. energy production, power plants and energy sources. Language of instruction: German/Finnish.
Modes of Study	Contact lessons 28, independent work approx. 24 hours. 2nd period: 1 group. Successfully completed written and spoken assignments or written and oral test. Continuous assessment requires 75% attendance and active participation.
Evaluation	Pass/fail.
Study materials	Material provided by the teacher.
Prerequisites	Courses at the level A2.1 or equivalent skills.

<i>FV12A5201</i>	<i>GERMAN INDEPENDENT STUDY</i>	<i>1 - 2 ECTS cr</i>
	Saksan itseopiskelukurssi	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, Pirjo Rantonen Lecturer, Theodor Steidel	
CEF Level	Teaching level: A2.2–C2.	
Aims	Students can improve their German skills at their own pace and according to their own needs following a schedule agreed on with the teacher. Independent work in German in the student's own field. Can be combined with the student's professional studies.	
Content	Dependent on what is agreed between the student and teacher, e.g. goals, contents and schedule.	
Modes of Study	Independent work approx. 26 or 52 hours. 1st period: group A 3rd period: group B Briefing at the beginning of the 1st and 3rd periods. Assessment based on a learning journal and assignments.	
Evaluation	Pass/fail.	
Prerequisites	Courses at the level A2.1 or equivalent skills.	

<i>FV12A5400</i>	<i>GERMAN SELF STUDY COURSE ON ECONOMICS</i>	<i>2 ECTS cr</i>
	Selbststudiumkurs Wirtschaft	
Year and Period	Period 4	
Teacher(s)	Lecturer, Pirjo Rantonen	
CEF Level	B1	
Aims	By the end of the course the students are expected to <ul style="list-style-type: none"> - be able to read and understand German texts on economics - be able to apply the vocabulary to their own communication. 	
Content	German company strategies, annual reports, result overviews. Texts on management and leadership.	
Modes of Study	Independent study course. Independent work approx. 52 hours. Learning journal. Assessment based on a learning journal and assignments.	
Evaluation	Pass/fail.	
Study materials	Web material.	

Prerequisites	Skills at the level B1.	
FV12A6201	LISTENING COMPREHENSION IN GERMAN	2 ECTS cr
	Hörkurs Deutsch	
Year and Period	Period 3	
Teacher(s)	Lecturer, Jörg Wunderlich	
CEF Level	Entry and teaching level: B1	
Aims	By the end of the course the students are expected to understand spoken language at a normal pace.	
Content	Listening comprehension exercises. Learning new standard language vocabulary. Language of instruction: German.	
Modes of Study	Self study course. 3rd period: 1 group Briefing in the beginning of the 3rd period. Listening comprehension test.	
Evaluation	Pass/fail.	
Study materials	On Blackboard.	
Prerequisites	Courses at the level A2.2 or equivalent skills.	
FV12A6600	GETTING TO KNOW AUSTRIA AND SWITZERLAND	2 ECTS cr
	Die Alpenländer	
Year and Period	Period 2	
Teacher(s)	Lecturer, Theodor Steidel	
CEF Level	Teaching level: B1	
Aims	To learn about the characteristics of Austria and Switzerland. By the end of the course, students will be able to	
Content	- give a short presentation on one of the topics dealt with on the course - recognise differences and similarities between German-speaking countries. Taking a look behind Austrian and Swiss stereotypes. Learning the essentials of the countries' history, culture, society and business through texts, videos and the Internet.	
Modes of Study	Language of instruction: German. Contact lessons 28, independent work approx. 24 hours. 2nd period: 1 group. Pair and group work in class, written and spoken assignments. Grade based on successfully completed assignments.	
Evaluation	Pass/fail.	
Study materials	Handouts given by the teacher.	
Prerequisites	Courses at the level A2.2 or equivalent skills.	
FV12A7110	BUSINESS GERMAN 1 - PERSONNEL MANAGEMENT	2 ECTS cr
	Wirtschaft 1 - Personalmanagement	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, Theodor Steidel Lecturer, Karita Riekkö	
CEF Level	Entry level: A2.1	
Aims	By the end of the course students will be expected	
	- to understand the main practices and principles when applying for a job in Germany	
	- to be able to write an application in German	
	- to be able to act in a job interview according to German customs	
	- to understand the main principles of personnel management in the German	

Content	<p>culture.</p> <p>- to be able to understand the basic vocabulary related to personnel management in German</p> <p>Fields: applying for a job, recruitment, basics of personnel management.</p> <p>Vocabulary, spoken, reading and writing exercises related to the field of the course. The course is suitable for students of all faculties.</p>
Modes of Study	<p>Opetuskieli: saksa.</p> <p>Individual, pair and group work.</p> <p>Contact lessons 28, independent work approx. 24 hours.</p> <p>2nd period: group A</p> <p>4th period: group B</p>
Evaluation	<p>Continuous assessment and successfully completed written assignments or a written test.</p> <p>Continuous assessment requires 75% attendance and active participation.</p> <p>Students who have taken the course FV12A7600 Wirtschaftssprache Deutsch are not eligible for this course because of the similar contents of the courses.</p>
Study materials	<p>Pass/fail.</p> <p>Provided by the teacher and on the web.</p>

FV12A7120	BUSINESS GERMAN 2 - MARKETING	2 ECTS cr
Year and Period	Wirtschaft 2 - Marketing	
Teacher(s)	Period 1, 4	
CEF Level	Lecturer, Jörg Wunderlich	
Aims	Entry level: A2.2	
Content	<p>By the end of the course, students are expected</p> <ul style="list-style-type: none"> - to know the vocabulary and structures used in marketing - to be able to create a simple marketing plan in German - to be able to discuss topics related to marketing - to be able to present the marketing strategy both orally and in writing - to be able to understand German marketing related texts. 	
Modes of Study	<p>Practising the basic marketing terminology in German with the help of cases.</p> <p>Planning a marketing strategy based on competitive tools of marketing. Pair and group work.</p> <p>Language of instruction: German.</p> <p>Contact lessons 28, independent work approx. 24 hours.</p> <p>1st period: group A</p> <p>4th period: group B</p> <p>Continuous assessment and successfully completed written assignments or a written test.</p> <p>Continuous assessment requires 75% attendance and active participation.</p>	
Evaluation	Pass/fail	
Study materials	Provided by the teacher and online.	

FV12A7130	BUSINESS GERMAN 3 - ENTERPRISES	2 ECTS cr
Year and Period	Wirtschaft 3 - Unternehmen	
Teacher(s)	Period 1, 3	
CEF Level	Lecturer, Theodor Steidel	
Aims	Entry level: A2.2	
Content	<p>By the end of the course students will be expected</p> <ul style="list-style-type: none"> - to know the main corporate forms in Germany and to describe them briefly in German - to be able to describe the structure of their own company thoroughly, both orally and in writing - to be able to evaluate the advantages and disadvantages of various corporate forms in German - to manage the central terminology related to the organisation of a company and work community in German. 	

Content	Fields: Corporate forms, establishing and presenting one's own company, the management and organisation of a work community. Individual, pair and group work. Vocabulary, spoken, reading and writing exercises related to the field of the course. The course is suitable for students of all faculties.
Modes of Study	Language of instruction: German. Contact lessons 28, independent work approx. 24 hours. 1st period: group A 3rd period: group B Continuous assessment and successfully completed written assignments or a written test. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV12A7600 Wirtschaftssprache Deutsch are not eligible for this course because of the similar contents of the courses.
Evaluation	Pass/fail
Study materials	Provided by the teacher. Material online.

FV12A7140	BUSINESS GERMAN 4 - ECONOMY	2 ECTS cr
Year and Period	Wirtschaft 4 - Volkswirtschaft	
Teacher(s)	Period 3 Lecturer, Karita Riekkö	
CEF Level	Entry level: B1	
Aims	By the end of the course students will be expected - to understand German texts on economics - to manage the central terminology of economics in German and use it in spoken and written language - to be able to tell about the special features of the Finnish economy in German, comparing them with other countries - to be able to analyse German texts on the field of the course.	
Content	Fields: labour market, wage structure and cost of living, foreign trade, economic fluctuation, globalisation. Individual, pair and group work. Vocabulary, spoken, reading and writing exercises related to the field of the course. The course is suitable for students of all faculties.	
Modes of Study	Language of instruction: German. Contact lessons 28, independent work approx. 24 hours. 3rd period: 1 group. Continuous assessment and successfully completed written assignments or a written test. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV12A8600 Makroökonomie ganz einfach are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/fail	
Study materials	Provided by the teacher. Material online.	

FV12A7200	FINNISH INDUSTRY IN GERMAN	2 ECTS cr
Year and Period	Finnische Industrie	
Teacher(s)	Period 1 Lecturer, Pirjo Rantonen	
CEF Level	Teaching level: B1	
Aims	By the end of the course, students will be expected - to be able to tell and write about Finnish industry and products - to be able to give a presentation on Finnish industry in German.	
Content	Exploring material on Finnish industry available in German. The course is suitable for students of all faculties.	

Modes of Study	Language of instruction: German. Contact lessons 28, independent work approx. 24 hours. 1st period: 1 group Individual, pair and group work. Successfully completed written and spoken assignments or a written and oral test.
Evaluation	Pass/fail.
Study materials	Material provided by the teacher and Finnish company web sites in German.
Prerequisites	Courses at the level A2.2 or equivalent skills.

FV14A3001	<i>RUSSIAN INTENSIVE COURSE IN ST. PETERSBURG</i>	3 ECTS cr
	Venäjän kielen intensiivikurssi Pietarissa, Русский язык интенсивно в Санкт-Петербурге	
Year and Period	Period 3	
Teacher(s)	N. N. Person in Charge: Lecturer, Pirjo Seppänen-Katajisto	
CEF Level	Target level: A2	
Aims	By the end of the course, students will be expected to <ul style="list-style-type: none"> • speak Russian more fluently and to better understand spoken language • understand the Russian way of life. 	
Content	Oral communication exercises and revision of grammar with a native Russian instructor. The course can be included in Russian as a minor subject. Language of instruction: Russian.	
Modes of Study	Contact lessons approx. 24, independent work approx. 54 h. The course will be held in the spring semester of 2010, exact dates and times will be given later. Registration in October. Five to ten students will be accepted. The course is aimed at students at a more advanced level. Active participation required.	
Evaluation	Written and oral tests at the end of the course. Pass/fail.	
Prerequisites	An advanced course in Russian, at least Russian for Working Life/Russian 3.	

FV14A7001	<i>RUSSIAN INDEPENDENT STUDY COURSE</i>	2 - 5 ECTS cr
	Venäjän itseopiskelukurssi kauppatieteiden ja tekniikan opiskelijoille, Самостоятельный курс для студентов экономических и технических специальностей	
	Independent study. The course is lectured every other year.	
Year and Period	Period 1–2	
Teacher(s)	Lecturer, Natalia Kurilova	
CEF Level	Entry level: A2–B1, target level: B1–B2.	
Aims	By the end of the course, students will have <ul style="list-style-type: none"> • improved and activated their Russian skills at their own pace through extensive reading, writing, speaking or listening exercises based on texts on business and technology • developed their language skills according to their own needs, interests and goals. The goals will be specified together with the student. 	
Content	Determined together with the student. Topics should be related to the student's field of expertise. Can be included in minor studies in Russian.	
Modes of Study	Language of instruction: Russian. Independent work following an individual study plan 52–130 hours, depending on the extent chosen by the student. Successfully completed assignments and meetings with the instructor.	

Evaluation	Learning journal.
Study materials	Pass/fail based on the course assignments and learning journal.
Prerequisites	Chosen by the student. Russkij jazyk dlja delovyh ljudej/Russian for Business People or equivalent skills.

<i>FV15A1210</i>	<i>BASIC COURSE IN FRENCH 1</i>	<i>2 ECTS cr</i>
	Ranskan peruskurssi 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, David Erent	
CEF Level	Entry level: 0, target level: A1	
Aims	By the end of the course, students are expected <ul style="list-style-type: none"> - to understand spoken language when it is slow, clear and related to topics discussed during the course - to use simple sentences to talk about themselves - to write a very simple text - to understand key words in a text related to topics discussed during the course - to use polite phrases and expressions typical of the French communication culture. 	
Content	Communication: introducing and describing oneself, communicating on the phone and by e-mail (in a very simple way), basic differences between formal and informal communication, proposing questions, expressing preferences. Structures: verbs in the present tense, articles, prepositions of place, prepositions à and de, personal pronouns, structures expressing ownership, negations, questions, numerals	
Modes of Study	Languages of instruction: French, Finnish and English. Exercises that support communication skills. Contact lessons 24, independent study approx. 28 hours. 1st period: group A 3rd period: group B. Written examination. Oral test or grade based on continuous evaluation. Continuous evaluation requires 75% attendance and active participation. Students who have taken the course FV15A1200 French 1 are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/fail. Written exam 50%, oral test or continuous evaluation 50%.	
Study materials	Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express, units 1-3. Material on Blackboard.	

<i>FV15A1220</i>	<i>BASIC COURSE IN FRENCH 2</i>	<i>2 ECTS cr</i>
	Ranskan peruskurssi 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, David Erent	
CEF Level	Entry level: A1.1, target level: A1.2	
Aims	By the end of the course, students are expected <ul style="list-style-type: none"> - to understand spoken language when it is slow, clear and related to topics discussed during the course - to use simple sentences to talk about themselves and their work - to use and understand simple sentences on the phone - to write very simple texts - to understand key words in a text related to topics discussed during the course - to use polite phrases and expressions typical of the French communication culture. 	
Content	Communication: communication when travelling, describing residences, describing objects, expressing and understanding times and timetables, communication on the phone and by e-mail.	

Modes of Study	Structures: articles, personal pronouns, verbs in the future tense, passé composé, construction and placement of adjectives, prepositions of place. Languages of instruction: French, Finnish and English. Exercises that support communication skills. Contact lessons 24, independent study approx. 28 hours. 2nd period: group A, 4th period: group B.
Evaluation	Written examination. Oral test or grade based on continuous evaluation. Continuous evaluation requires 75% attendance and active participation. Students who have taken the course FV15A1200 French 1 are not eligible for this course because of the similar contents of the courses.
Study materials	Pass - Fail Written exam 50%, oral test or continuous evaluation 50% Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 1, units 4-5. Material on Blackboard.

FV15A1410	INTERMEDIATE COURSE IN FRENCH 1	2 ECTS cr
	Ranskan jatkokurssi 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, David Erent	
CEF Level	Entry level: A1.2, target level: A2.1	
Aims	By the end of the course, students are expected - to cope in situations practised during the course - to be able to discuss topics introduced during the course using simple sentences - to write short texts on topics introduced during the course - to understand the main idea of texts on topics discussed during the course - to understand and apply the most important French customs.	
Content	Communication: talking about work, the working place and conditions, presenting a company (very briefly), talking about products, going to a restaurant, shopping, talking about food, communication related to job application: writing a CV. Structures: articles, prepositions, imperfect, partitive, interrogative pronouns, demonstratives, personal pronouns. Languages of instruction: French, Finnish and English.	
Modes of Study	Exercises that support communication skills. Contact lessons 24, independent study approx. 28 hours. 1st period: group A, 3rd period: group B. Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV15A1400 French 2 are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/fail.	
Study materials	Written examination 50%, oral test or continuous assessment 50% Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 1, units 6–8. Material on Blackboard.	
Prerequisites	French 1 or equivalent skills.	

FV15A1420	INTERMEDIATE COURSE IN FRENCH 2	2 ECTS cr
	Ranskan jatkokurssi 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, David Erent	
CEF Level	Entry level: A2.1, target level: A2.2	
Aims	By the end of the course, students are expected - to cope in situations practised during the course - to be able to discuss topics introduced during the course using simple	

Content	<p>phrases</p> <ul style="list-style-type: none"> - to write a short and simple text related to topics discussed during the course - to understand the main idea of texts on topics discussed during the course - to understand and apply the most important French customs. <p>Communication: talking about the working day, describing production processes (in an very simple way), giving and understanding instructions, prohibitions and suggestions, talking about failures and fixing them, going to a bank, going to a doctor, describing people, talking about the past and future.</p> <p>Structures: articles, imperfect and passé composé, future, conditional, imperative, objects of personal pronouns, relative pronouns.</p>
Modes of Study	<p>Languages of instruction: French, Finnish and English.</p> <p>Exercises that support communication skills.</p> <p>Contact lessons 24, independent study approx. 28 hours.</p> <p>2nd period: group A, 4th period: group B.</p>
Evaluation	<p>Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV15A1400 French 2 are not eligible for this course because of the similar contents of the courses.</p>
Study materials	<p>Pass/fail.</p> <p>Written examination 50%, oral test or continuous assessment 50%. Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 1, units 8-10. Material on Blackboard.</p>

<i>FV15A1500</i>	<i>FRENCH PRONUNCIATION</i>	<i>2 ECTS cr</i>
Year and Period	Ranskan ääntämiskurssi	
Teacher(s)	Period 1 tai 2, 3 Lecturer, Vuokko Paakkonen Lecturer, David Erent	
CEF Level	Entry level: A1.	
Aims	By the end of the course, students are expected	
Content	<ul style="list-style-type: none"> - to pronounce correctly the speech sounds practised during the course - to identify the speech sounds practised during the course based on their spelling - read texts aloud according to French liaison rules - read texts aloud according to French intonation and rhythm - to identify the sounds practised during the course in speech and utilise them in listening comprehension - to utilise phonetic writing to support correct pronunciation - to identify mistakes in their own pronunciation and to correct them. <p>The French vowel and consonant sounds, of which the most important ones for oral communication will be handled in more detail. The writing corresponding to the sounds. Phonetic symbols. Liaison, rhythm and intonation.</p>	
Modes of Study	<p>Languages of instruction: French or Finnish. If there are exchange students in the group, they will get instruction in English, if needed.</p> <p>Group A: Practising pronunciation using mainly the Gattegno method. Pronunciation and listening comprehension exercises in the language lab. Contact lessons 28 (a weekend course; times will be set together with the students). Independent work approx. 23 hours. Introductory session at the beginning of the 1st period.</p> <p>1st or 2nd period: group A: Learning journal and approved exercises. Continuous assessment and the Gattegno method require 80% attendance and active participation.</p> <p>3rd period: group B: Pronunciation and listening comprehension exercises in the language lab. Contact lessons 28, independent work approx. 24 hours. Approved exercises. Continuous assessment (requires at least 50% attendance and active participation) or a final exam.</p>	

Evaluation	Pass/fail. Group A: exercises and learning journal 50%, continuous assessment 50%. Group B: exercises 50%, continuous assessment or the final exam 50%
Study materials	Provided by the teacher. Material on Blackboard. Additional material available in the self-access centre of the Language Centre.

FV15A1610	FRENCH FOR WORKING LIFE 1	2 ECTS cr
	Työelämän ranskaa 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, David Erent	
CEF Level	Entry level: A2.2, target level: B1.1	
Aims	By the end of the course, students are expected to be able - to cope orally and in writing in the work-related situations practised on the course - to understand and apply the most important French work related customs.	
Content	Communication: describing tasks, describing action plans, describing the operation of equipment, describing products, communicating in meetings, talking about projects, talking about marketing, communicating on the phone and by e-mail. Structures: articles, prepositions, pronouns, present tense, passé composé and imperfect, future and conditional. Language of instruction: French.	
Modes of Study	Exercises that support communication skills. Contact lessons 24, independent study approx. 28 hours. 1st period: group A, 3rd period: group B.	
	Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV15A1600 French for working life are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/fail.	
Study materials	Written examination 50%, oral test or continuous assessment 50% Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 2, units 1-3. Material on Blackboard.	

FV15A1620	FRENCH FOR WORKING LIFE 2	2 ECTS cr
	Työelämän ranskaa 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, David Erent	
CEF Level	Entry level: B1.1., target level: B1.2	
Aims	By the end of the course, students are expected to be able - to cope orally and in writing in various work-related situations practised on the course - to understand and apply the most important French work related customs.	
Content	Communication: making a complaint and responding to it, responding to problems, explaining and specifying problems, expressing one's will and intentions, recommendations, giving operating instructions, talking about the past, describing companies, communicating on the phone and by mail. Structures: articles, prepositions, present tense, passé composé and imperfect, past perfect, conditional, direct speech and reported clause, expressing causes and time. Language of instruction: French.	
Modes of Study	Exercises that support communication skills. Contact lessons 24, independent study approx. 28 hours.	

Evaluation	2nd period: group A, 4th period: group B. Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV15A1600 French for working life are not eligible for this course because of the similar contents of the courses. Pass/fail.
Study materials	Written examination 50%, oral test or continuous assessment 50% Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 2, units 3-5. Material on Blackboard.

FV15A4000	SUGGESTOPEDIC FRENCH COURSE	2 ECTS cr
Year and Period	Suggestopedinen ranska	
Teacher(s)	Period 3/4 Lecturer, Vuokko Paakkonen	
CEF Level	Entry level: A2/B1.	
Aims	By the end of the course, students are expected to be able - to communicate orally in changing and even surprising general language situations - to understand speech on various subjects at a standard language level - to communicate orally more unreservedly and spontaneously than at the beginning of the course - to encounter new language situations more boldly.	
Content	Activation of oral skills with the help of the suggestopedic method. Simulation of basic situations in everyday and working life. Language of instruction: French.	
Modes of Study	Pair and group work using role play, relaxation techniques, and exercises improving creativity. Contact hours 32. Independent work approx. 18 h. This is a weekend course; the dates and times will be agreed upon with the students. Briefing in the beginning of the 3rd period. Learning journal. Continuous assessment and the suggestopedic method require 80% attendance and active participation.	
Evaluation	Pass/fail.	
Study materials	Provided by the teacher.	

FV15A5010	BUSINESS FRENCH 1	2 ECTS cr
	Français de l'entreprise 1	
Year and Period	Period 1	
Teacher(s)	David Erent	
CEF Level	Entry level: B1.2	
Aims	By the end of the course, students are expected to be able - to communicate both orally and in writing in work-related situations practised during the course - to understand and apply the most important French work-related customs.	
Content	Communication: communication related to organising events at work, communication in meetings (both written and oral), understanding texts and interviews related to business life, reclamations and reacting to them, expressing opinions and reacting to them, communication by mail and e-mail. Structures: adverbs, structures expressing aims and consequences, past perfect, subjunctive, past tense conditional, passive, structures expressing emphasis. Language of instruction: French.	
Modes of Study	Exercises that support communication skills. Contact lessons 24, independent study approx. 28 hours. 1st period (1 group). Written examination. Oral test or grade based on continuous assessment.	

Evaluation	Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV15A5000 Français de l'entreprise are not eligible for this course because of the similar contents of the courses. 0–5
Study materials	Written examination 50%, oral test or continuous assessment 50% Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 2, units 6-8. Material on Blackboard.

FV15A5020	BUSINESS FRENCH 2	2 ECTS cr
	Français de l'entreprise 2	
Year and Period	Period 2	
Teacher(s)	Lecturer, David Erent	
CEF Level	Entry level: B1	
Aims	By the end of the course, students are expected to be able - to communicate successfully both orally and in writing in work-related situations practised during the course - to understand and apply the most important French work-related customs.	
Content	Communication: conversations, arguments, negotiations, oral presentation and responding to it. Structures: connectors, subjunctive, gerund, futur antérieur. Language of instruction: French.	
Modes of Study	Exercises that support communication skills. Contact lessons 24, independent study approx. 28 hours. 2nd period: 1 group.	
Evaluation	Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. 0–5	
Study materials	Written examination 50%, oral test or continuous assessment 50% Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 2, units 8-10. Material on Blackboard.	

FV15A6001	INTERCULTURAL COURSE IN FRENCH	3 ECTS cr
	Cours interculturel	
	This course is suitable for French students, too.	
Year and Period	Period 4	
Teacher(s)	Lecturer, David Erent	
CEF Level	Teaching level: B1.	
Aims	By the end of the course, Finnish students are expected - to be able to describe the Finnish people and culture to a French speaking person, paying attention to the characteristics of the French culture - to apply the interactive skills practiced during the course when encountering a new culture. By the end of the course, French speaking students are expected - to know Finnish people and the Finnish culture in general terms and to pay attention to the characteristics of the Finnish culture when communicating with a Finn - to apply the interactive skills practiced during the course when encountering a new culture.	
Content	Subjects related to Finland that will be agreed upon with the students and discussed in small groups. Every task consists of the preparation phase, presenting the task and the following conversation.	
Modes of Study	Contact lessons 28. Independent study (incl. group work) approx. 50 hours. 4th period: 1 group. Approved exercises and continuous assessment, requires 75% attendance and	

Evaluation	active participation.	
Study materials	Pass/fail. Provided by the teacher and the students.	
FV15A9301	FRENCH INDEPENDENT STUDY	1 - 4 ECTS cr
	Ranskan itseopiskelukurssi tekniikan ja kauppatieteiden opiskelijoille	
Year and Period	Period 3–4	
Teacher(s)	Lecturer, Vuokko Paakkonen	
CEF Level	Entry level: B1	
Aims	By the end of the course, students must demonstrate having - improved their independent study skills - attained the goals in their study plan for developing language and communication skills.	
Content	Students define the contents in their study plan in detail. Languages of instruction: French or Finnish.	
Modes of Study	Independent work following an individual study plan, approximately 25 - 103 hours. The course is completed in the form of tutored independent study; meetings with the teacher are discussed at the beginning of the course. The course can be integrated with business or technology studies or studies abroad. An introductory session is arranged at the beginning of the 3rd period. Study guidance in introductory lecture.	
Evaluation	Pass/fail based on assignments and a learning journal.	
Study materials	Chosen by the student.	
FV16A1210	BASIC COURSE IN SPANISH 1	2 ECTS cr
	Espanjan peruskurssi 1	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Sari Pärssinen	
CEF Level	Entry level: 0	
Aims	By the end of the course, students are expected to be able: - to use simple structures and vocabulary in presentations both in studies and in the world of work - to introduce themselves both orally and in writing.	
Content	Introducing oneself, professions, presentations, hobbies. Structures: pronouns, nouns, adjectives and verbs in the present tense. Languages of instruction: Finnish and Spanish.	
Modes of Study	Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. 1st period: groups A and B 2nd period: group C 3rd period: group D 4th period: group E Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Students who have passed the course FV16A1200 Spanish 1 are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass / fail.	
Study materials	Es español (units 1–3) Blackboard: "Recursos en español"	
FV16A1220	BASIC COURSE IN SPANISH 2	2 ECTS cr
	Espanjan peruskurssi 2	
Year and Period	Period 2, 3, 4	
Teacher(s)	Lecturer, Sari Pärssinen	

CEF Level	Entry level: A1.1
Aims	By the end of the course, students are expected to be able: - to use basic structures and vocabulary related to both studies and work - to describe a place of residence - to communicate in restaurants and shops.
Content	Describing places of residence, location, going to a restaurant, food, describing things. Structures: pronouns, comparative forms of adjectives, "to be". Languages of instruction: Finnish and Spanish.
Modes of Study	Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. 2nd period: groups A and B 3rd period: group C 4th period: group D. Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Students who have passed the course FV16A1200 Spanish 1 are not eligible for this course because of the similar contents of the courses.
Evaluation	Pass/fail
Study materials	Es español (units 4–6) Blackboard: "Recursos en español"

<i>FV16A1251</i>	<i>ESSENTIAL SPANISH VOCABULARY</i>	<i>1 ECTS cr</i>
	Espanjan kielen ydinsanasto	
	Independent study course. Cannot be included in compulsory language studies.	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, Javier Gonzalez Garcia	
CEF Level	A1	
Aims	By the end of the course students will be expected to know the essential Spanish vocabulary. An extended vocabulary basic vocabulary will improve the students' performance in further Spanish courses.	
Content	Areas of vocabulary: essential verbs, verbs in connection with pronouns, applying for a job, presenting a company, communication both in daily and work-related situations.	
Modes of Study	Independent study approx. 26 hours. 1st period: group A 2nd period: group B 3rd period: group C 4th period: group D A written exam in the exam aquarium. Students who have passed the course FV16A1250 Basic Spanish Vocabulary are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/Fail.	
Study materials	Glossary provided by the teacher. Blackboard: "Recursos en español"	

<i>FV16A1410</i>	<i>INTERMEDIATE COURSE IN SPANISH 1</i>	<i>2 ECTS cr</i>
	Espanjan jatkokurssi 1	
Year and Period	Period 1, 3, 4	
Teacher(s)	Lecturer, Sari Pärssinen	
CEF Level	Entry level: A1.2	
Aims	By the end of the course, students are expected to be able: - to use structures and vocabulary needed in communication situations both at work and in everyday life - to relate events from the recent past both orally and in writing.	

Content	Spare time, everyday life, body parts, expressing opinions, making appointments, telling about the past.
Modes of Study	Structures: pronouns, gerund, reflexive verbs, adverbs, perfect tense. Languages of instruction: Finnish and Spanish. Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. 1st period: groups A and B 3rd period: groups C and D 4th period: group E.
Evaluation	Written examination. Oral test or grade based on continuous assessment.
Study materials	Continuous assessment requires 75% attendance and active participation. Students who have passed the course FV16A1400 Spanish 2 are not eligible for this course because of the similar contents of the courses. Pass / fail Es español (units 7–9) Blackboard: "Recursos en español"

<i>FV16A1420</i>	<i>INTERMEDIATE COURSE IN SPANISH 2</i>	<i>2 ECTS cr</i>
	Espanjan jatkokurssi 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, Sari Pärssinen	
CEF Level	Entry level: A1.2+	
Aims	By the end of the course, students are expected to be able: - to use the structures and vocabulary needed in communication situations both at work and in daily life - to describe the past both orally and in writing.	
Content	Describing events and situations in the past, work history, future plans. Structures: pronouns, imperfect, preterite, past perfect, relative sentences. Languages of instruction: Finnish and Spanish.	
Modes of Study	Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. 2nd period: groups A and B 4th period: groups C and D.	
Evaluation	Written examination. Oral test or grade based on continuous assessment.	
Study materials	Continuous assessment requires 75% attendance and active participation. Students who have passed the course FV16A1400 Spanish 2 are eligible for this course because of the similar contents of the courses. Pass / fail. Es español (units 10–12) Blackboard: "Recursos en español"	

<i>FV16A1601</i>	<i>SPANISH FOR WORKING LIFE</i>	<i>2 ECTS cr</i>
	Työelämän espanjaa	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, Javier Gonzalez Garcia	
CEF Level	Entry level: A2.1	
Aims	By the end of the course, students are expected to be able: - to use the structures and vocabulary needed in work-related communication situations - to express opinions, - to present companies orally and - to apply for a job in writing.	
Content	Expressing opinions, applying for a job, invitations, meetings, presenting a company, organisational structure, corporate culture. Structures: subjunctive, conditional, indirect speech. Languages of instruction: Finnish and Spanish.	
Modes of Study	Exercises that support communication skills.	

Evaluation	Contact lessons 28, independent study approx. 24 hours.
Study materials	1st period: groups A and B, 3rd period: groups C and D.
Prerequisites	Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Pass/fail. Socios 2 (units 1–6). FV16A1420 Spanish for Beginners 4, FV16A1400 Spanish 2 or equivalent skills.
FV16A1701	UNDERSTANDING SPANISH AROUND THE WORLD 2 - 3 ECTS cr
	Entender español en el mundo
	Independent study
Year and Period	Period 1–2, 3–4
Teacher(s)	Lecturer, Javier Gonzalez Garcia
CEF Level	Entry level: A2.2
Aims	By the end of the course, students are expected: - to understand the regular speech of native Spanish speakers (intonation, sentence structures and pace) - to have improved their listening comprehension and writing skills.
Content	100–150 minutes of audio-visual material about various real-life situations.
Modes of Study	Successful completion requires summaries or essays. Independent work approx. 52–78 h. 1st–2nd period: group A 3rd–4th period: group B
Evaluation	Pass/Fail
Study materials	AV material provided by the teacher. Blackboard: "Recursos en español"
Prerequisites	Intermediate course in Spanish 2, Spanish 2 or equivalent skills.
FV16A2202	FACTS ABOUT SPAIN 3 ECTS cr
	Conozca España
Year and Period	Period 1, 1–2, 3–4
Teacher(s)	Lecturer, Javier Gonzalez Garcia
CEF Level	Entry level: A2.2
Aims	By the end of the course, students are expected to be familiar with Spain and its geography, history, society and economy as well as the Spanish culture.
Content	Learning about historical events and changes in Spain from various points of view. Topics dealt with during the course include e.g. culture, art, society, economy, politics, broadcasting and current issues, and the global presence and importance of the Spanish language.
Modes of Study	Language of instruction: Spanish. There are two options for completing the course: 1. Successfully completed written assignments or a written exam. Contact lessons 28 and independent work approx. 50 hours: 1st period: group A or 2. During an exchange period in Spain, by completing the assignments previously agreed upon with the instructor responsible for the course. 1st–2nd period: group B 3rd–4th period: group C.
Evaluation	Pass/fail.
Study materials	Will be agreed upon with the teacher. Blackboard: "Recursos en español"

Prerequisites	Spanish for Working Life or equivalent skills.	
<i>FV16A3201</i>	<i>BUSINESS SPANISH</i>	<i>3 ECTS cr</i>
	Español de negocios	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, Javier Gonzalez Garcia	
CEF Level	Entry level: A2.2	
Aims	By the end of the course, students are expected to be able: <ul style="list-style-type: none"> - to communicate in Spanish in basic business situations - to understand the business culture of the Spanish speaking countries - to present and market products. 	
Content	Business culture, products, marketing, business communication in the Spanish-speaking world. Also suited for technology students.	
Modes of Study	Language of instruction: Spanish. Exercises that support business communication. Students give a presentation on a Finnish or Spanish company. Contact lessons 28, independent work approximately 50 hours. 2nd period: groups A and B 4th period: group C.	
Evaluation	Written test. Continuous assessment or oral test. The course can also be carried out in a Spanish-speaking country by completing assignments given in advance by the teacher.	
Study materials	0–5. Socios 2 (units 7–12). Blackboard: "Recursos en español"	
Prerequisites	Spanish for Working Life or equivalent skills.	
<i>FV16A5201</i>	<i>INTERCULTURAL SPANISH COURSE</i>	<i>3 ECTS cr</i>
	Curso intercultural entre Finlandia y España	
Year and Period	Period 3	
Teacher(s)	Lecturer, Javier Gonzalez Garcia	
CEF Level	Entry level: B1.	
Aims	By the end of the course, students are expected to be able to describe Finns, Finland and the Finnish culture in Spanish, and to compare these issues to the corresponding Spanish ones.	
Content	The cultural characteristics of Spain and Finland. Subjects include history, geography, culture and society. Students may suggest subjects of their own interest. The emphasis will be on cultural cooperation.	
Modes of Study	Language of instruction: Spanish. The teacher will lead the discussion and comparison of the cultures together with Spanish exchange students. Students will give a presentation in pairs, in which they compare Finnish and Spanish cultures. Contact lessons 28, independent study approx. 50 hours. 3rd period (1 group).	
Evaluation	Continuous assessment (requires 75% attendance and active participation).	
Study materials	Pass/fail. Handouts in class. Blackboard: "Recursos en español"	
Prerequisites	Spanish for Working Life or equivalent skills.	
<i>FV18A9101</i>	<i>FINNISH 1</i>	<i>2 ECTS cr</i>
	Finnish 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, Elina Häkkinen	
CEF Level	A1.1	

Aims	After the course students are expected to be able to 1. understand a very simple Finnish conversation (about topics dealt with during the course) in which the people speak very slowly 2. tell about themselves in Finnish using very simple expressions 3. use simple Finnish everyday phrases 4. understand the main contents of a very simple text on concrete topics with the help of a dictionary 5. write very simple sentences on course topics with the help of a dictionary.
Content	Topics: greeting people, introducing oneself, telling about one's plans and schedules, asking for the price, grocery shopping, family, expressing time Grammar: the Finnish phonetic and orthographic system, numbers, verb conjugation, negative sentences, questions, partitive, genitive, consonant gradation, i>e change
Modes of Study	The languages of instruction: Finnish and English. Individual and group work that support learning to communicate in Finnish. Contact lessons 28, homework approximately 24 hours. 1st period 1: groups A, B, C and D 3rd period 3: groups E and F. A written examination.
Evaluation	Pass/fail.
Study materials	Handouts given in class.
Prerequisites	No previous knowledge of the Finnish language is expected.

FV18A9201	FINNISH 2	2 ECTS cr
Year and Period	Finnish 2 Period 2, 4	
Teacher(s)	Lecturer, Elina Häkkinen	
CEF Level	A1.1	
Aims	By the end of the course students are expected to be able to 1. take part in a very simple conversation on topics dealt with during the course 2. cope orally in simple everyday situations which are dealt with during the course 3. understand directions 4. relate what happened in the past.	
Content	Topics: location, travelling, shopping, weather, seasons, hobbies, describing people, asking for directions Grammar: locative cases, postpositions, object cases, 3rd infinitive, singular imperative, past tense	
Modes of Study	The languages of instruction: Finnish and English. Simple literary texts will be studied both in class and as homework. In the classroom the newly learnt language material will be practiced by working in pairs and groups plus by doing other similar activities. Contact lessons 28, homework approximately 24 hours. 2nd period 2: groups A and B 4th period 4: group C. A written examination.	
Evaluation	Pass/fail.	
Study materials	Handouts given in class.	
Prerequisites	Finnish 1 or equivalent knowledge.	

FV18A9301	FINNISH 3	2 ECTS cr
Year and Period	Finnish 3 Period 3-4	
Teacher(s)	Lecturer, Elina Häkkinen	
CEF Level	A1.2	
Aims	By the end of the course the students are expected to be able to - discuss simple issues that are dealt with during the course	

Content	- talk about the past more elaborately - cope orally in a simple situation involving health care - read simple newspaper articles on concrete topics with the help of a dictionary Topics: profession and work, living-related and household issues, opinion, emotions, health, setting appointments, phone conversations Grammar: present perfect tense, transitive, passive, expressing necessity, more advanced sentence types, plural imperative, adjective comparison. The languages of instruction: Finnish and English.
Modes of Study	Texts with some new vocabulary and grammatical structures will be studied in class and as homework. Different kinds of spoken situations will be practiced. There will be lectures on grammar as well as different written grammar exercises. Contact lessons 28, homework approximately 24 hours. A written exam.
Evaluation	Pass/fail.
Study materials	Handouts given in class.
Prerequisites	Finnish 1 and 2 or equivalent knowledge.

FV18A9820	LEARNING TOGETHER - CONVERSATION AND CULTURE IN FRENCH AND FINNISH	1 ECTS cr
Year and Period	Learning Together - Conversation and Culture in French and Finnish	
Teacher(s)	Period 1–2, 3–4 Lecturer, Elina Häkkinen	
CEF Level	A1–C2	
Aims	By the end of the course the students are expected to be able to - show that they have improved their Finnish language skills and their cultural skills according to the aims determined by them at the beginning of the course.	
Content	Language of instruction: English.	
Modes of Study	Contact lessons 4. Work in pairs 22 hours. The course can be completed during either one or two semesters. A learning diary will be required. The teacher will announce the time of the first meeting by e-mail.	
Evaluation	Pass/Fail.	

FV19A1000	CHINESE 1	3 ECTS cr
Year and Period	Chinese 1	
Teacher(s)	Period 1–2, 3–4 Part-time Untenured Teacher, Matina Ma	
CEF Level	A1.1	
Aims	By the end of the course students will be able • to read and write Chinese phonetics, • to formulate simple sentences, • to produce simple everyday greetings, • to use a Chinese dictionary.	
Content	In the first period, students will learn Chinese phonetics through speaking and listening. In the second period, students will work on Chinese characters and develop a basic knowledge of the sentence structure. Topics include greetings, numbers and time, introduction of self and family.	
Modes of Study	Language of instruction: English and Chinese. 56 contact lessons, meeting twice a week. Each lesson lasts one and a half hours. 1st–2nd period: group A 3rd–4th period: group B. 75% attendance is required.	
Evaluation	0–5. Exams (60%) and continuous assessment (40%).	
Study materials	Provided by the teacher.	

Prerequisites	The course is meant for beginners.	
FV19A2000	CHINESE 2	3 ECTS cr
	Chinese 2	
Year and Period	Period 1–2, 3–4	
Teacher(s)	Part-time Untenured Teacher, Matina Ma	
CEF Level	A1.2	
Aims	By the end of the course students are expected to <ul style="list-style-type: none"> • be able to deal with basic modern Chinese grammar • have the ability to understand and write simple passages • be able to read Chinese with satisfactory intonation • be able to understand short, slowly spoken dialogues • be able to speak about simple topics. 	
Content	Topics include travelling and shopping in Chinese communities, personal information and employment, daily schedule, family and interests. Language of instruction: English and Chinese.	
Modes of Study	56 contact lessons, meeting twice a week. Each lesson lasts one and a half hours. 1st–2nd period: group A 3rd–4th period: group B. 75% attendance is required.	
Evaluation	0–5. Exams (60%) and continuous assessment (40%).	
Study materials	Provided by the teacher.	
Prerequisites	Successful completion of FV19A1000 Chinese 1 or having equivalent skills.	
FV19A3001	CHINESE FOR WORKING LIFE	3 ECTS cr
	Chinese for Working Life	
Year and Period	Period 1–2, 3–4	
Teacher(s)	Part-time Untenured Teacher, Matina Ma	
CEF Level	A2.1	
Aims	By the end of the course students are expected to <ul style="list-style-type: none"> • be able to read articles on topics dealt with in the course • know essential Chinese modern grammar • be able to exchange ideas with native speakers on topics concerning school and social life, provided that the speech is relatively slow and clear • understand some aspects of the Chinese culture. 	
Content	Topics include Chinese table manners, an introduction to business Chinese, a Chinese modern wedding and Finland in Chinese. Language of instruction: English and Chinese.	
Modes of Study	56 contact lessons, meeting twice a week. Each lesson lasts one and a half hours. 1st–2nd period: group A 3rd–4th period: group B. 75% attendance is required. Students who have taken the course FV19A3000 Chinese for Working Life 1 are not eligible for this course because of the similar contents of the courses.	
Evaluation	0–5. Exams (60%) and continuous assessment (40%).	
Study materials	Provided by the teacher.	
Prerequisites	Successful completion of FV19A2000 Chinese 2 or having equivalent skills.	
FV19A5000	CHINESE FOR ORAL COMMUNICATION	3 ECTS cr
	Chinese for Oral Communication	
Year and Period	Period 1–2, 3–4	
Teacher(s)	Part-time Untenured Teacher, Matina Ma	
CEF Level	A1 - A2	

Aims	During the course, students will <ul style="list-style-type: none">• work on polishing their pronunciation• work on improving their listening skills• work on listening and speaking skills on topics dealt with in the course.
Content	Topics include life in Chinese communities, traveling, accommodation, Chinese cuisine, entertainment, introduction of essential Chinese values and Chinese festivals.
Modes of Study	Language of instruction: Chinese, English and Finnish. 56 contact hours, meeting twice a week. Each lesson lasts one and a half hours. 1st–2nd period: group A 3rd–4th period: group B. 75% attendance is required.
Evaluation	0–5. Exams (60%) and continuous assessment (40%).
Study materials	Provided by the teacher.
Prerequisites	Successful completion of FV19A2000 Chinese 2 or equivalent skills.

9. Minor Subjects in English

There may be restrictions to selecting a minor subject in certain Master's programmes. These limitations are listed in this study guide in the section dedicated to the Master's programmes. Additional information is provided by the study counselling staff of each Master's programme.

The minor subjects taught in English at LUT are:

Faculty of Technology:

Bio-Energy Technology, 22 ECTS, see page 16 for more information.

Environmental Energy Technology, 21 ECTS, see page 17 for more information.

Chemical Engineering, min 20 ECTS, see page 26 for more information.

Advanced Design Methodology, 23 ECTS, see page 24 for more information.

Packaging Technology, 20 ECTS, see page 50 for more information.

Technical Physics, min 20 ECTS, see page 75 for more information.

Technomathematics, min 20 ECTS, see page 73 for more information.

Power Electronics and Electrical Drives, min 20 ECTS, see page 41 for more information.

Industrial Embedded Systems, 21 ECTS, see page 40 for more information.

Faculty of Technology management:

Intelligent Computing

Minor: Intelligent Computing. Recommended for Technomathematics Students only

<i>Choose minimum 20 credits</i>		<i>per.</i>	<i>ECTS cr</i>
CT50A4000	Introduction to Intelligent Computing	3-4	5
CT50A5700	Introduction to Computer Graphics	2	5
CT50A6000	Pattern Recognition	3-4	7
CT50A6100	Machine Vision and Digital Image Analysis	1-2	7
CT50A6200	Computer and Robot Vision	1-2	7

School of Business:

Business Administration

Business Administration 20 op

<i>Electives, min. 20 ects credits should be selected</i>		<i>per.</i>	<i>op</i>
AB30A0300	International Finance and Emerging Markets	2	5
AB30A0550	International Financial Management	3	6
AB40A0500	Innovation and Competitiveness	4	5
AC40A0101	Cross-Cultural Marketing Strategies	2	6
AC40A0150	Integrated Marketing Communication	4	5
AC40A0201	Internationalization of the Firm	2	6
AC40A0251	Sales Management and Personal Selling	3-4	6
AC50A0300	Organizational Learning and Competence Management	2-3	6
AC60A0400	International Accounting and Analysis	1-2	6

10. University Administration and Professors

The amended Universities Act will enter into force on 1 January 2010, and LUT regulations will be amended accordingly and will enter into force at the beginning of January 2010.

University senate

The university senate is the university's highest decision-making body. Its members include the rector, both vice-rectors, two representatives from among the professors of the university, two other staff representatives, two representatives chosen by the student union and two representatives from outside interest groups.

Rector, vice-rectors and director of administration

The rector of the university is Professor Ilkka Pöyhönen. The first vice-rector, Professor Hannu Rantanen, is in charge of education, and the second vice-rector, Professor Veli-Matti Virolainen, is in charge of research. The university's director of administration is Juha-Matti Saksa, D.Sc. (Econ. & Bus.Admin.).

Faculties, deans and faculty councils

The university comprises three faculties headed by deans:

- Faculty of Technology, dean: Professor Esa Marttila
- Faculty of Technology Management, dean: Professor Markku Tuominen
- School of Business, dean: Professor Jaana Sandström

The highest decision-making body of a faculty is the faculty council.

The faculties are divided into departments and laboratories, which have their own directors. Degree programmes are lead by the head of the degree programme. Each faculty has a head of administration and a head of study affairs.

University Services

University Services is responsible for university-wide services that support the university's basic tasks. The head of University Services is the director of administration.

Professors (updated 1 June 2009)

FACULTY OF TECHNOLOGY

Faculty of Technology

D.Sc.(Tech.)	Käyhkö, Jari	Fibre and Paper Technology	1.1.2009	31.12.2009
D.Sc.(Tech.)	Marttila, Esa	Environmental Technology	1.6.1997	

LUT Energy

D.Sc.(Tech.)	Ahola, Jero	Electronics	1.8.2008	31.7.2010
D.Sc.(Tech.)	Backman, Jari	Fluid Dynamics	1.9.2008	31.12.2009
D.Sc.(Tech.)	Honkapuro, Samuli	Electrical Power Systems, esp. Electricity Market	28.2.2009	12.1.2010
D.Sc.(Tech.)	Horttanainen, Mika	Environmental Technology, esp. waste management technology and the energy recovery of waste	1.1.2009	31.12.2009
D.Sc.(Tech.)	Hypänen, Timo	Modelling of Energy Conversion Systems	1.10.2007	30.9.2012
D.Sc.(Tech.)	Kyrki-Rajamäki,	Nuclear Engineering	1.9.2002	

	Riitta			
D.Sc.(Tech.)	Larjola, Jaakko	Fluid Dynamics	1.8.1998	
D.Sc.(Tech.)	Lindh, Tuomo	Applied Control Engineering	1.3.2009	28.2.2010
D.Sc.(Econ. & Bus.Adm.)	Linnanen, Lassi	Environmental Technology, Environmental Management	1.5.2004	
D.Sc.(Tech.)	Partanen, Jarmo	Electrical Engineering	1.4.1994	
D.Sc.(Tech.)	Pyrhönen, Juha	Electrical Drives Technology	1.3.1997	
D.Sc.(Tech.)	Pyrhönen, Olli	Applied Control Engineering	1.3.2005	
D.Sc.(Tech.)	Ranta, Tapio	energy technology, esp. bioenergy technology	1.1.2009	31.12.2010
D.Sc.(Tech.)	Sarkomaa, Pertti	Engineering Thermodynamics	1.11.1974	30.6.2009
D.Sc.(Tech.)	Silventoinen, Pertti	Electronics	1.7.2008	
D.Sc.(Tech.)	Soukka, Risto	Environmental Technology	1.6.2009	31.12.2010
D.Sc.(Tech.)	Tarjanne, Risto	Energy Economics	1.4.1990	30.11.2009
D.Sc.(Tech.)	Tuutti, Veikko	Power Plant Engineering	1.8.2008	31.12.2009
D.Sc.(Tech.)	Vakkilainen, Esa	Renewable Energy Systems	2.1.2008	31.12.2009
D.Sc.(Tech.)	Viljainen, Satu	Electrical Power Systems, esp. Electricity Market	1.4.2007	31.7.2011
LUT Chemistry				
M.Sc.(Tech.)	Henricson, Kaj	Pulp Technology	1.7.2007	30.6.2009
M.Sc.(Tech.)	Häkkinen, Antti	Solid-Liquid Separation	1.6.2009	31.12.2009
D.Sc.(Tech.)	Kajanto, Isko	Paper Converting	1.2.2008	31.7.2012
PhD	Kraslawski, Andrzej	Process Technology, esp. Technology Based on Innovative Solutions	1.6.2005	
D.Sc.(Tech.)	Lindström, Matti	Physical Chemistry	1.1.1980	
D.Sc.(Tech.)	Louhi-Kultanen, Marjatta	Chemical Unit Operations	1.1.2009	31.12.2009
D.Sc.(Tech.)	Mänttari, Mika	Membrane Technology	1.10.2008	31.7.2009
D.Sc.(Tech.)	Paatero, Erkki	Chemical Technology	1.1.1992	
D.Phil.	Siren, Heli	Chemistry	1.1.2008	
D.Sc.(Tech.)	Turunen, Ilkka	Design of Industrial Processes	1.1.1999	
LUT Mechanical				
D.Sc.(Tech.)	Björk, Timo	Steel Structures	1.8.2008	31.7.2009
PhD	Cameron, David	Materials Technology	1.7.2008	30.6.2010
D.Sc.(Tech.)	Hertzen von, Raimo	Mechanics and Strength of Structures	1.7.2005	15.8.2009
D.Sc.(Tech.)	Kujanpää, Veli	Welding Technology	1.10.2007	31.12.2011
D.Sc.(Agr.& For.)	Kärki, Timo	Wood Technology	1.12.2008	30.11.2010
D.Phil.	Lindell, Henry	Flexible Packaging Technologies	1.8.2008	31.7.2013
D.Sc.(Tech.)	Martikainen, Jukka	Welding Technology	1.2.1998	
D.Sc.(Tech.)	Mikkola, Aki	Virtual Design	1.6.2002	
D.Sc.(Tech.)	Pöyhönen, Ilkka	Wood Technology	1.4.1997	
D.Sc.(Tech.)	Salminen, Antti	Mechanical Engineering, esp. Manufacturing Technology	1.6.2009	31.12.2009
D.Sc.(Tech.)	Varis, Juha P.	Production Engineering	1.2.2008	

Mathematics and Physics

D.Sc.(Tech.)	Alatalo, Matti	Scientific Computing	1.5.2008	30.4.2010
D.Phil.	Haario, Heikki	Applied Mathematics	1.1.2005	
D.Phil.	Lukka, Markku	Applied Mathematics	1.1.1997	
D.Phil.	Lähderanta, Erkki	Physics	1.9.2004	
D.Phil.	Tuuva, Tuure	Physics	1.6.2008	31.5.2010
D.Phil.	Vartiainen, Erik	Physics	1.11.2004	31.7.2009

CEID

D.Sc.(Tech.)	Handroos, Heikki	Machine Automation	1.3.1998	
D.Sc.(Tech.)	Wu, Huapeng	Robotics	1.6.2009	31.12.2009

FACULTY OF TECHNOLOGY MANAGEMENT**Faculty of Technology**

D.Sc.(Tech.)	Harmaakorpi, Vesa	Industrial Engineering and Management, esp. Innovation Systems	1.3.2007	28.2.2011
D.Sc.(Econ. & Bus.Adm.)	Hilmola, Olli- Pekka	industrial Management, esp. Railway Logistics	1.4.2008	31.3.2013
D.Sc.(Tech.)	Rantanen, Hannu	Industrial Management, esp. Engineering and Technology Management	1.11.2006	
D.Sc.(Tech.)	Torkkeli, Marko	Industrial Management, esp. Technology and Business Innovations	1.6.2008	31.5.2013

Department of Industrial Management

D.Sc.(Tech.)	Huiskonen, Janne	Industrial Management, esp. Logistics	1.8.2008	31.7.2010
D.Sc.(Tech.)	Kärri, Timo	Industrial Management, esp. Management Accounting in Industrial Enterprises	1.8.2008	31.7.2010
D.Sc.(Tech.)	Kässi, Tuomo	Engineering and Technology Management	15.8.2000	
M.Sc. (Econ. & Bus.Adm.)	Lampela, Hannele	industrial Management, esp. Knowledge Management	1.1.2009	31.7.2009
D.Sc.(Econ. & Bus.Adm.)	Lehtomaa, Ahti	Industrial Management, esp. Technological Entrepreneurship	1.3.2005	
D.Phil.	Miettinen, Asko	Industrial Management, esp. Technological Entrepreneurship	1.9.2008	31.7.2009
D.Sc.(Tech.)	Pirttilä, Timo	Industrial Management, esp. Logistics	1.9.1998	
Lic.Sc.(Econ & Bus.Adm.)	Pitkänen, Seppo	Engineering and Technology Management	1.8.1984	
D.Sc.(Tech.)	Salminen, Risto	Industrial Management, esp. Marketing	1.6.2009	
D.Sc.(Tech.)	Tuominen, Markku	Industrial Management, esp. Management Information Systems	1.12.1988	
D.Sc.(Tech.)	Väätänen, Juha	Industrial Management, esp. International Operations and Marketing in Industrial Enterprises	1.10.2008	31.7.2009

Department of Information Technology

D.Sc.(Tech.)	Kerttula, Esa	Telematics	1.6.1989	30.4.2012
D.Sc.(Tech.)	Kyrki, Ville	Information Technology, esp. Intelligent Robotic Systems	1.6.2009	31.12.2009
D.Sc.(Tech.)	Kälviäinen, Heikki	Information Processing	1.11.1999	
D.Sc.(Tech.)	Kämäräinen, Joni	Information Society Technologies	1.10.2008	30.9.2013
D.Sc.(Tech.)	Porras, Jari	Communications Engineering	1.6.2005	
D.Phil.	Smolander, Kari	Software Engineering, esp. Software Architectures	1.8.2006	31.7.2011

SCHOOL OF BUSINESS**Department of Business Economics and Law**

D.Sc.(Econ. & Bus.Adm.)	Jantunen, Ari	Strategy Research	1.2.2009	31.1.2014
D.Phil.	Kemppinen, Jukka	Business Law, esp. Information and Technology Law	1.3.2007	29.2.2012
D.Sc.(Econ. & Bus.Adm.)	Kyläheiko, Kalevi	Economics, esp. Technology Research	1.5.2005	
D.Sc.(Econ. & Bus.Adm.)	Martikainen, Minna	Finance	1.10.2005	30.9.2010
D.LL.	Niemi, Matti	Civil Law	1.10.2001	
D.Sc.(Tech.)	Puumalainen, Kaisu	Technology Research, esp. Methodology	1.7.2008	
D.Sc.(Tech.)	Sandström, Jaana	Strategic Management Accounting	1.5.2008	30.4.2013
D.Sc.(Econ. & Bus.Adm.)	Vaihekoski, Mika	Finance	1.9.2004	
D.LL.	Villa, Seppo	Business Law	1.12.2003	

Department of Management and International Business

D.Sc.(Econ. & Bus.Adm.)	Aaltio, Iiris	Business Administration, esp. Management and Organizations	1.8.1997	
D.Sc.(Tech.)	Asikainen, Sanna- Katriina	Business Administration, International Marketing	1.10.2007	30.9.2012
D.Sc.(Econ. & Bus.Adm.)	Blomqvist, Kirsimarja	Knowledge Management	1.6.2008	31.5.2013
D.Sc.(Tech.)	Hallikas, Jukka	Supply Management	1.8.2008	31.7.2009
D.Sc.(Econ. & Bus.Adm.)	Heilmann, Pia	Management and Organizations	1.8.2008	31.7.2009
D.Sc.(Econ. & Bus.Adm.)	Jussila, Iiro	Management and Organizations	1.8.2008	31.7.2009
D.Soc.Sc.	Juuti, Pauli	Management and Organizations	1.11.2007	31.10.2009
D.Sc.(Econ. & Bus.Adm.)	Kianto, Aino	Knowledge Management	1.8.2008	31.7.2009
D.Sc.(Econ. & Bus.Adm.)	Kuivalainen, Olli	International Marketing	15.5.2009	31.12.2009
D.Sc.(Econ. & Bus.Adm.)	Pihkala, Timo	Management and Organizations, esp. Entrepreneurship and SME Management	1.3.2005	28.2.2010
D.Sc.(Econ. & Bus.Adm.)	Saarenketo, Sami	International Marketing	1.10.2007	30.9.2012
D.Sc.(Tech.)	Virolainen, Veli-Matti	Supply Management	1.1.2008	

11 How to Prepare a Master's Thesis in Technology

The instructions on preparing a Master's Thesis will be amended during the autumn term 2009. The new instructions will be published on the university web site.

*The following instructions on preparing a Master's thesis, issued by the vice-rector on 4 June 2008 and revised on 10 June 2009, are observed at Lappeenranta University of Technology. **Faculties may also give their own instructions for the Master's thesis.***

The Master's thesis is the final project of the Master's degree studies. It demonstrates the student's knowledge of a scientifically or societally important topic related to his or her professional field. It is an advanced research assignment which requires approximately 6 months of work and is worth 30 ECTS credits. The student must demonstrate the ability to carry out the project independently and following a plan. The student also takes a maturity test on the topic of the Master's thesis and prepares a written report according to instructions.

The Master's thesis can be a collaborative effort of two or more students. In such cases the work of each individual student should be distinguished and evaluated separately.

Starting the Work

Students who wish to start working on their Master's thesis should read these instructions carefully and meet with the professor in charge of the field (usually a professor of the student's major subject). The student discusses the topic of the thesis with the professor to make sure it meets the scientific requirements for a Master's thesis.

Especially the following points should be reviewed:

- the prerequisites for starting the Master's thesis (completed studies)
- the topic and objective of the thesis
- the supervising professor
- public access to the thesis
- examiners of the thesis (the supervising professor is always the 1st examiner)
- topic application to the head of the degree programme
- an initial outline of the work
- funding (by the student, a grant or an employer) and
- matters to be discussed with the community providing the funding and the supervisor representing it.

Topic, Supervisors and Examiners of the Master's Thesis

The Master's thesis is related to the student's major subject and its topic is agreed on by the supervisor and the student together. The student applies for the approval of the topic of the Master's thesis and the appointment of the supervising professor and examiners from the head of the degree programme. The student's individual study plan is attached to the application. The form is available on the university web site.

The head of the degree programme will appoint an LUT professor or adjunct professor as the supervisor for the thesis. The supervisor must specialise in the student's major subject. The head of the degree programme will also appoint two examiners, the first of which is always the supervising (adjunct) professor. The second examiner can be appointed from outside LUT. If the second examiner is not a professor or an adjunct professor, he/she must have at least a higher university degree.

In addition, the thesis usually has a supervisor who represents the company or university that commissioned the thesis. This supervisor is approved by the supervising professor (1st examiner) on signing the application for the topic.

The following requirements for the approval the thesis topic apply to **students who complete the new M.Sc. (Tech.) degree (120 ECTS credits)**:

- a completed Bachelor's degree (if the student has been admitted to complete both the Bachelor's and Master's degrees)
- possible complementary studies completed (if the student has been admitted to complete only the Master's degree)
- the compulsory internship for the Master's degree completed
- a minimum of 15 ECTS credits of the major studies for the Master's degree completed
- other studies possibly required by the faculty or degree programme.

Applying for Master's thesis work at a company is the student's responsibility. If the student wishes to start preparations for the thesis before the topic is officially approved, this should be discussed with the professor of the major subject (the possible supervisor).

The topic application can be submitted when the required studies are completed and thesis work has been obtained from a company and discussed with the supervising professor.

Language of the Master's Thesis

The Master's thesis is written in Finnish, Swedish or English. The student may also apply for permission from the head of the degree programme to write it in another language in connection with the topic application. The author of the thesis is responsible for the language revision of the thesis. Students of degree programmes organised in English also write their Master's thesis in English.

Employee Inventions

The research work for a Master's thesis may result in an invention that can be patented or otherwise protected by industrial law. An invention may be a new or improved technical device or method with industrial or commercial importance.

Inventions must be discussed with all parties involved (the student, supervisors at the university and the commissioning company). Measures should be taken to protect the invention before the thesis is published.

If the invention has ensued under an employment relationship, the Act on the Right in Employee Inventions (656/1967) is applied to the company. If the employment relationship is between the student and a university or higher education institution, the act on the right in employee inventions at higher education institutions (369/2006) is applied to the school.

General patenting legislation is applied to the patenting of an invention and general copyright legislation to copyright issues unless otherwise agreed by the parties involved in the work (the commissioner, university and student).

Further information is available from the university's research and innovation services.

Maturity Test

Students must take a written maturity test to demonstrate their language skills and how well they know the topic of their thesis. The maturity test is taken in the language in which the student has received his or her education in Finland. If the student has received his or her education in a language other than Finnish or Swedish, the head of the degree programme determines the language of the maturity test. In such cases only the contents of the maturity test is evaluated, not the language.

If the student has demonstrated his or her Finnish or Swedish skills in connection with the Bachelor's degree or another previous university degree, only the content of the maturity test will be evaluated and the head of the degree programme may decide to accept the presentation given by the student in the Master's degree seminar as the maturity test. Degree programmes may also have other ways of substituting the maturity test.

If a student has not passed the maturity test in the Bachelor's degree or in another previous university degree (or if the student completes the 180-credit unit Master's degree in accordance with the old degree structure), he or she must take a supervised maturity test. No reference material is allowed and both the contents and language will be evaluated. The contents will be assessed by the 1st examiner of the Master's thesis and the language will be evaluated by a language consultant assigned by the university.

The maturity test is evaluated on a scale of passed/failed.

Details are also available from the Language Centre study guide, the faculty study guidance staff and the university web site.

Examination and Evaluation of the Master's Thesis

The faculty council will assess the thesis. The assessment is based on the thesis itself and on the statement of the examiners. Students must apply for the assessment.

The student provides the examiners each with their own, bound copy. In addition, the student leaves the assessment application, abstracts in Finnish and English and a bound copy/copies of the Master's thesis to the faculty's study affairs services (the Faculty of Technology: 2 copies, the Faculty of Technology Management 1 copy). Foreign students do not need to prepare an abstract in Finnish. **The faculty decides on the meeting dates and deadlines, by which the student must submit the above-mentioned material to the examiners and faculty's study affairs services.**

The examiners prepare a written statement on the thesis along with a grade proposal to the faculty council. If the thesis was a group project, separate statements and grade proposals are given for the sections prepared by each individual student. The statement must individually examine the following points on which the faculty council bases its assessment:

- the theoretical and/or practical results of the work
- originality
- coherence and careful preparation of the text
- language

In addition, the examiners or the faculty may specify other aspects considered in the evaluation.

Master's theses are graded on the following scale:

- excellent (5)
- very good (4)
- good (3)
- very satisfactory (2)
- satisfactory (1).

The title and grade of the thesis are shown in the degree certificate. The grade of the Master's thesis does not affect the overall grade of the degree.

If a student is not satisfied with the evaluation, he or she may leave a request for correction with the faculty council within 14 days of the day the grade was made known. The request for correction should be addressed to the faculty council in question and submitted in writing to the faculty's study affairs administration. Students must submit the request in writing within 14 days of the day the grade was made known. They also have the right to find out why they were given the grade.

Students who are dissatisfied with the decision may bring the matter before the degree board within 14 days of having been informed of the decision. A request addressed to the degree board in writing is to be submitted to the Study Affairs Office.

The faculty council may require that the author of the Master's thesis give a brief (approx. 20 min.) public presentation of the thesis.

Public Access to the Master's thesis

The supervising professor must see to it that the commissioner and author of the thesis are aware of the following policies concerning public access to the thesis when the study is begun.

Master's theses submitted to the university for examination are normally public documents. If the thesis includes information that the commissioner wishes to remain confidential, the thesis may be classified confidential for a period of two years in connection with its approval. In such cases, the commissioner must provide the university in writing with the reasons for confidentiality.

If a confidentiality period longer than two years is required, two versions of the thesis must be prepared: a public and a confidential one. The public version should not contain any confidential information. In addition, the public version must mention that a confidential one exists.

Confidential theses are handled in the faculty council meeting following normal procedure. If there are separate public and confidential versions, both are handled in the faculty council meeting. Faculty council members are liable for keeping the information confidential, and the agenda and minutes of the meeting are not to include anything in violation of this confidentiality. The period of confidentiality shall be mentioned in the minutes of the meeting.

Notice of Confidentiality

If the thesis includes confidential information (held confidential for a maximum of two years), the commissioner of the thesis must submit a written notification of the extent of the confidential information, the reasons for confidentiality and the time the information is to be held confidential (usually in full years). The student is responsible for forwarding the notice to the faculty's study affairs services. The notice is submitted along with the assessment application, at the latest.

The Master's thesis will include the mention "Confidential" and the date the confidentiality expires.

Writing a Thesis

The Master's thesis is a written report on the research work involved, presenting the stages of the work, the methods, results and explanations. The format of the thesis is based on commonly applied Finnish standards and guides (e.g. Tirronen K., 1987). In accordance with these instructions, the following format is applied at Lappeenranta University of Technology:

Covers and Layout

The Master's thesis is bound in black, hard covers, size A4.

On the front cover, printed in gold (*painokulta*), font Times or equivalent:

- MASTER'S THESIS (centred, bottom margin 200 mm, font size 44pt) and
- Author's name and year of publication (lower right-hand corner, bottom and right margin 30-35 mm, font size 22 pt).

Another alternative is the cover recommended by LUT's publication committee, including the university's logo in gold in the upper left-hand corner. Further instructions on the cover format recommended by the publication committee are available on the university web site.

On the back, printed in gold (*painokulta*), font Times or equivalent:

- MASTER'S THESIS (left alignment, left margin 40 mm)
- Author's name
- Year of publication (right alignment, right margin 30 mm)

The thesis is printed on standard A4 paper sheets. It can be printed on both sides of the paper or on one side only. In a bound thesis the left margin is 35-50 mm. The upper margin is 30-35 mm and the right margin approximately 22 mm. The recommended line spacing is 1.5. If the paper is double-sided, you should remember that odd and even pages have different margins. Each paragraph is aligned to the left, there are no indentations and there is an empty line between paragraphs. For a neat layout, try justified alignment. The margins also apply to appendices; especially the left one is important in book binding.

If drawings are an essential part of the thesis but need not be included in the bound copy, the originals or photocopies of them are enclosed in a separate A4-sized folder.

If the thesis was a group project, the contributions of each student are bound together in order of content. Each part must contain the author's name and a list of references. The common table of contents must indicate the author of each part. Otherwise, the general guidelines apply also to a group project.

Title and Title Page

The title of the Master's thesis is either the one approved along with the topic or modified from it. Modifications to the originally approved title are merely additional details and agreed on with the supervising professor. The title must be well-defined and correspond to the content of the thesis. A key word, which expresses something essential about the thesis and has an explicit and specific meaning, is recommended as the first word. Examples of inappropriate key words: some, review, method, report, study, equipment etc. Abbreviations are not allowed.

Examples of titles:

- Torsion Control in a Permanent Magnetic Synchronous Motor
- Bleaching Plant Waste Water Treatment in the Sulphate Cellulose Process

The title page is the first, unnumbered page of the thesis. **The faculty decides on the information presented on the cover page. However, the following is always printed on it:**

- university, faculty, degree programme
- author's name
- title of the thesis
- examiners and supervisors of the thesis

The points above are not to be used as headings on the title page, e.g. "University: Lappeenranta University of Technology" is incorrect, but "Lappeenranta University of Technology, Faculty of Technology" is correct. The layout of the title page should be balanced, such as in assignment reports.

Abstracts in Finnish and English

The abstract is a concise (one A4 sheet), independent summary of the Master's thesis. It should be intelligible as such, without the original document. The abstract presents the key contents and relevance of the thesis. The abstract is written in Finnish and English. Foreign students may write the abstract in English only.

A good abstract is written in complete and concise sentences. The author does not express his or her opinions, but describes the thesis as would an outside reporter. No direct references are made to the original text. The abstract should fit on one A4 paper sheet.

The complete identification information should be included in the beginning of both the Finnish and the English abstract:

Finnish abstract:

TIIVISTELMÄ (in bold font)

Lappeenranta teknillinen yliopisto

Faculty

Degree Programme

* Author's name *

*** Thesis title in Finnish *
(in bold font)**

Diplomityö

* year of publication *

* number of pages, figures, tables and appendices * (xx sivua, xx kuvaa, xx taulukkoa ja xx liitettä)

Tarkastajat: Professor * name *
Professor * name *

Asiasanat:
Keywords:

English abstract:

ABSTRACT (in bold font)

Lappeenranta University of Technology

*Faculty in English *

*Degree Programme in English *

* Author's name *

*** Thesis title in English *
(in bold font)**

Master's thesis

* year of publication *

* number of pages, figures, tables and appendices * (xx pages, xx figures, xx tables and xx appendices)

Examiners: Professor * name *
Professor * name *

Keywords:

In addition to these general instructions, the faculties may give further guidelines on e.g. the layout of the abstract (e.g. students may need to fill out a form).

The abstracts are to be attached to the assessment application, and they will be forwarded to the LUT library by the study affairs staff. The author sends electronic copies of the abstracts to the LUT library. Further instructions and information on the electronic copies of the abstract are available at the LUT library and its web site.

The abstract is a public document, and therefore all confidential information must be excluded from it.

Table of Contents

The table of contents lists all of the headings and their page numbers in chronological order. The pages are numbered in Arabic numerals starting from the table of contents. A separate list of figures and tables can be included at the end of the table of contents.

Decimals and indentations are used in the table of contents – as well as in the headings in the text – according to the following example. If variables need to be used in the first-level headings, they are to be written out as they are in equations. In such cases the author and the supervising professor may decide on the most appropriate way to present the headings in order to obtain a neat and legible layout.

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List of Symbols and Abbreviations (if Needed)

Symbols, abbreviations and terms which are not common knowledge are listed in alphabetical order along with their definitions and arranged in groups: e.g. first Roman symbols, then Greek ones and finally abbreviations. The list of symbols and abbreviations is placed immediately after the table of contents.

Foreword or Acknowledgments (Optional)

In the foreword, the author acknowledges the contribution to the research work made by the examiners and supervisors as well as any help, guidance, advice etc. received from outsiders. The author may also thank sponsors for their financial support and guidance. He or she concludes the foreword by dating and signing it.

Introduction

The actual research report is opened with an introduction. The purpose of the introduction is to introduce the topic and awaken the reader's interest. The introduction contains a brief presentation of the background, extent and objectives of the research and its relation to other studies and literature in the field. It also describes the key points of the research report. It does not, however, include detailed descriptions of the theory, methods or results.

Discussion

The discussion is divided into chapters with headings that depict the organisation of the thesis (in exactly the same form as in the table of contents). In this section, the author relates all of the material he or she wishes in reply to the research questions posed, as well as the conclusions based on the material. The discussion must be drawn up in such a way that a professional in the field can repeat the research work e.g. to check the equations, expressions, measurements, calculations or results and conclusions.

The language of the thesis must be grammatically correct and the expression coherent, accurate and concise. The topic must be presented to the reader unequivocally, intelligibly and consistently. The style must be academic and the technical terminology established. In particular, the use of foreign words should be avoided. They should be replaced with paraphrases or expressions in the language of the thesis.

The presentation and organisation are determined by the topic. A typical way to organise the thesis is to first discuss the material and theory, followed by the methods and finally the conclusions.

In order for the observations to be of use to others, the stages of the research work must be presented in complete and the results of the observations in their original form in tables etc. Long sequences of equations and programming code are appended with headings. It is not necessary to show the derivation of the equations quoted, although the author must make sure the equations are presented correctly. However, the derivation of new expressions and equations introduced in the thesis must be shown, at least in outline.

Equations must be written clearly, each on their own line so that they are separated from the text. They may, for instance, be indented. Equations are numbered either consecutively or by chapter. The number is written in parentheses on the right-hand side of the column. References to an equation can be made only after it has been presented, with certain exceptions. Figures and tables are captioned and numbered similarly to equations. Figures and tables have to be referred to in the text, preferably before they are introduced. The captions of tables are placed above the table and those of figures below the figure. Figures and tables are not to include foreign words.

In mathematical presentation, the author must use standard symbols if such exist and if not, other established symbols. In the absence of established symbols the author may create new ones. The name of a unit symbol, e.g. the electric charge Q , must be mentioned when it is first introduced in the text and repeated when needed. Standard conventions must be followed when marking variables. For instance, variables in equations, charts and figures are *written in italics*, **vectors in bold italics** (or in italics and topped with an arrow, \vec{E}). Subscripts and superscripts or numbers are not italicised, unless they refer to a variable. For example: There is a relationship between the electric field strength E_1 and the electric flux density D_1 , which depends on permittivity ϵ

$$D_1 = \epsilon E_1.$$

Mathematical functions and operators are written in normal text type (sin, log, lim, etc.).

Matrices can be handled as regular variables. Equations can be used as parts of sentences with normal punctuation. Punctuation marks are placed immediately after the equation, not its number. Standardised graphic symbols are used in drawings and graphs. Their figures and variables are expressed in the same way as in equations.

Discussion and Conclusions

Depending on the nature and scope of the study, the report ends either with the chapter "Conclusions", or two separate chapters, e.g. "Discussion" and "Conclusions". The discussion demonstrates e.g. the agreement of the theory and empirical results and what causes it. The need for further research and possible practical applications may also be argued here. The conclusions consist mainly of the final results, what the author has discovered through the research and how they relate to issues discussed in literature. The results should be compared to those previously published in the field.

References in the Text and List of References

The purpose of a reference is to provide sufficient information on a source used in the study that allows the source to be identified and obtained, if necessary. References should be made to the original sources to avoid possible misinterpretations and misprints appearing in second-hand citations. References are usually made in accordance with the name-and-year system (the so-called Harvard system) and the number designation system. The student should consult the supervising professor when deciding which system to use.

In the name-and-year system (the Harvard system) the reference list is alphabetised according to the first author of the source. If several sources by the same author or group of authors are referenced, they are listed in order of publication. When referencing several sources published by an author within the same year, they are distinguished from each other with a lower case letter after the publication year (1999a, 1999b etc.). If the author is unknown, the abbreviation Anon. can be used instead of the author's name. Alternatively, the name of the publication can be used as the reference.

In the number system, the references are listed in the order they appear in the text. The list is numbered consecutively.

Also unpublished reference material and important oral communications must be listed. The reference list must also indicate where rare and less known sources are available.

Electronic sources are referred to according to the SFS 5831 standard. Further information is available on the library web site www.lut.fi/fi/kirjasto, in the library's SFS standard collection and the library administrators. Electronic documents should be referenced only if no other original source exists.

Detailed instructions on the Harvard and number systems are available in literature (e.g. Nykänen O., 2002, p. 76-110).

Appendices

Supplementary information, such as figures, tables, software code and mathematical derivations, should be appended.

The heading of an appendix is written at the top of the page.

Appendices are numbered. If the number is positioned in the upper right-hand corner of the page, Roman numerals are used (Appendix I, Appendix II). If the number is placed before the heading, Arabic numerals are used (Appendix 1. Heading, Appendix 2. Heading). If the appendix consists of several pages, the pages are marked as follows:

For example: 1 Appendix I, 1
 Appendix I, 2 etc.

For example: 2 Appendix 1. Heading

- (continued on page x) is written at the bottom of the page
- (Appendix 1 continued) is written in the upper right-hand corner of the following page.

Appendix pages are not numbered.

Useful Sources for the Author of a Master's Thesis

Literature

Airila, M. & Pekkanen, M. 2002. Tekniikan alan väitöskirjaopas. Hallinto-osaston julk. 2002/3. Espoo, TKK. 73 s. ISBN 951-225822-6

Barnet, S. & Bedau, H. 1999. Critical thinking reading and writing. A brief guide to argument. Boston, Bedford 462 p. ISBN 0-312-17153-6

Day, R. A. 1998. How to Write and Publish a Scientific Paper. Cambridge, Cambridge University Press. 211 s. ISBN 0 521 36572 4

Haarala, R. (päätoim.) 1990 – 1994. Suomen kielen perussanakirja I – III. Kotimaisten kielten tutkimuskeskuksen julkaisuja 55. Helsinki, Painatuskeskus Oy. 2008 s. ISBN 951-861-433-4

Iisa, K., Oittinen, H. & Piehl, A. 2002. Kielenhuollon käsikirja. Uudistetun ja päivitetyn laitoksen 1. painos. Helsinki, Yrityskirjat Oy. 357 s. ISBN 952-9660-42-1

Itkonen, T. (tarkistanut ja uudistanut Sari Maamies), 2000. Uusi kieliopas. Helsinki, Tammi. 456 s. ISBN 951-31-1716-2

Nykänen, O. 2002. Toimivaa tekstiä. Opas tekniikasta kirjoittaville. Helsinki, TEK. 212 s. ISBN 952-5005-64-X

Oesch, R. & Pihlajamaa, H. 2003. Patenttioikeus. Keksintöjen suoja. Helsinki, Talentum. 303 s. ISBN 952-14-0734-4

Quantities, units and symbols in physical chemistry. Prep. for publication by Ian Mills et al. 2nd ed. IUPAC Oxford, Blackwell. 1998. 166 s. ISBN 0-632-03583-8

Rajala, K. (toim.) 1998. Tutkimuksen tekijänoikeudet. Helsinki, Werner Söderström lakitieto Oy. 211 s. ISBN 951-670-020-9

Tirronen, K. 1987. Teknisen kirjoituksen laatiminen. Helsinki, Suomen Teknillinen Seura ja Teknillisten Tieteiden Akatemia. 89 s. ISBN 951-9110-36-4

Woolever, K. R. 1999. Writing for the technical professions. New York, Longman. 536 p. ISBN 0-321-01122-8

Finnish Standards on Writing and Presentation

SFS 3655. Suureet ja yksiköt. Suurenimet, tunnuksset ja yksiköt. 2. p. 1982.

SFS 3855. Tiivistelmien laatiminen ja käyttö. 1978.

SFS 4004. Suureet ja yksiköt. Alaindeksit 2. p. 1992.

SFS 5342. Kirjallisuusviitteiden laatiminen. 2. p. 1992.

SFS 5831. Viittaaminen sähköisiin dokumentteihin tai niiden osiin. 1998.

SFS-ISO 31-0 + A1. Suureet ja yksiköt. Osa 0: Yleiset periaatteet. 1999.

SFS-ISO 31-11. Suureet ja yksiköt. Osa 11: Matemaattiset merkinnät fysikaalisissa tieteissä ja tekniikassa. 1999.

SFS-ISO 1000 + A1. SI-yksiköt sekä suositukset niiden kerrannaisten ja eräiden muiden yksiköiden käytöstä. 1999.

Internet Sources

The Finnish Terminology Centre TSK
Research Institute for the Languages of Finland
Finnish Standards Association SFS

www.tsk.fi
www.kotus.fi
www.sfs.fi

Hannu Rantanen
Vice-Rector

12 How to prepare a Master's Thesis in Business Administration

The following instructions on preparing a Master's thesis, issued by the vice-rector on 23 May 2007, are observed at Lappeenranta University of Technology. Revised 6 May 2008 and 5 June 2009.

The Master's thesis is the final project of the Master's degree studies. It demonstrates the student's knowledge of a scientifically or socially important topic related to his or her professional field. The thesis is a research project which requires approximately six months of full-time work and is worth 30 ECTS credits. The student must demonstrate the ability to carry out the project independently and following a plan. The student also takes a maturity test on the topic of the Master's thesis and prepares a written report according to instructions.

Starting the Master's Thesis

Students who are starting their Master's thesis should read these instructions carefully and meet with the professor in charge of the field (usually a professor of the student's major subject). The student discusses the topic of the thesis with the professor to make sure it meets the scientific requirements for a Master's thesis.

Especially the following points should be reviewed:

- the prerequisites for starting the Master's thesis (completed studies)
- the topic and objective of the thesis
- supervisor of the Master's thesis
- publicity of the study
- examiners of the thesis (the supervising professor is the first examiner)
- submitting an application for the approval of the topic to the department's study coordinator
- an initial outline of the work
- funding (by the student, a grant or an employer)
- matters to be discussed with the community providing the funding and the supervisor representing it.

General Comments

The aim of the advanced research seminar is to introduce students to the basics of business research and help them complete their thesis.

Students take part in the thesis seminar in their second year of studies, and they must have completed their Bachelor's degree in business administration before the seminar. Major subjects may also have their own, additional requirements, which are listed in the degree requirements. Students should study them carefully. The extent of the thesis and seminar is 30 ECTS credits.

Language of the Master's Thesis

The Master's thesis can be prepared in Finnish, Swedish or English. Permission for using other languages is granted by the head of the degree programme. The author of the thesis is responsible for the language revision of the thesis.

In Master's programmes taught in English, the Master's thesis is also prepared in English.

Applying for a Topic

Students must have completed their B.Sc. (Econ. & Bus. Admin.) degree (with the exception of those admitted directly into a Master's programme) and possible complementary studies before applying for a topic for their thesis.

The student applies for the approval the Master's thesis topic and the appointment of a supervising professor and examiners from the head of the degree programme. The head of the degree programme appoints a faculty professor or adjunct professor as the supervisor of the thesis and two examiners, the first of which is the supervisor. The examiners are usually professors or adjunct professors. The second examiner may also be a person from outside LUT with at least a higher university degree. If one or both of the examiners change, this must be approved by the head of the degree programme.

The student asks the examiners to sign the application and submits it to the study coordinator. The student's personal study plan is attached to the application. The study plan is confirmed by the study coordinator. The application form, instructions and deadlines are available at: <http://www.lut.fi/en/business/studies/forms/Pages/Default.aspx> or the study coordinator.

The topic is applied for at the beginning of the project when it has been agreed on with the supervising professor. The title does not need to be finalised upon application; it may be modified during the course of the project.

The thesis may also have several authors. In such cases, each student must independently prepare and indicate their own section of the study.

Important! The topic of the Master's thesis will not be handled in the month that the student obtains his/her Bachelor's degree.

The Master's thesis will not be evaluated in the same month as the thesis topic is approved.

Maturity Test

Students must take a written maturity test to demonstrate their language skills and how well they know the topic of their thesis. The maturity test is evaluated by the supervisor of the thesis and a language reviser approved by the university. The maturity test is taken in the language in which the student has received his or her education in Finland. If the student has received his or her education in a language other than Finnish or Swedish, the head of the degree programme determines the language of the maturity test. In such cases only the contents of the maturity test is evaluated, not the language.

If a student has demonstrated his or her language skills in connection with the Bachelor's degree or other previous university degree, the language of the maturity test will not be evaluated, only the contents. In such cases, the head of the degree programme may decide to allow the student to substitute the presentation given in the thesis seminar for the maturity test. If the student has not passed the maturity test in connection with his/her Bachelor's degree or another previous university degree, the test will be taken in supervised facilities, and both its language and its content will be evaluated.

The maturity test may also be written on a computer. For further information, please see www.lut.fi/opiskelu/nykyiset_opiskelijat/kuulustelut/kypsyysnayte.html.

The maturity test should be taken five weeks before graduation. The supervisor/examiner will determine the earliest possible date for taking the test. The date and time for the test should be set together with the examiner and faculty office. The examiner gives the topic of the test.

The maturity test is evaluated on a scale of passed/failed.

Further information in the study guide of the LUT Language Centre.

Assessment of the Master's Thesis

The thesis must be reviewed by the examiners before it is printed.

The student turns in the final, printed version of the Master's thesis bound in a black cover to the examiners (one for each) at least 14 calendar days before the faculty council meeting where the thesis is up for approval. Also an application for evaluation, abstracts in Finnish and English, a possible request for confidentiality from the commissioner of the thesis, and a third copy bound in a black cover are to be submitted to the study coordinator **at least 14 calendar days before the above-mentioned faculty council meeting.**

The examiners prepare a written statement on the thesis along with a grade proposal to the faculty council. The title of the thesis, the grade and the names of the examiners are indicated in the degree certificate. If the thesis is written by several authors, the sections prepared independently by each author are evaluated separately. The grade of the Master's thesis does not affect the overall grade for the major subject.

The faculty council evaluates and approves the Master's thesis upon application. Forms, deadlines and faculty council meetings are available at: www.lut.fi/kati/opiskelu.php

If a student is not satisfied with the evaluation, he or she may leave a request for correction with the faculty council within 14 days of the day the grade was made known. The request for correction should be addressed to the faculty council in question and submitted in writing to the faculty's head of study affairs. Students must submit the request in writing within 14 days of the day the grade was made known. They also have the right to find out why they were given the grade.

Students who are dissatisfied with the decision may bring the matter before the degree board within 14 days of having been informed of the decision. A request addressed to the degree board in writing is to be submitted to the Study Affairs Office.

The students Master's thesis may be evaluated in the month that the student will obtain his/her Master's degree.

Assessment Criteria

Purpose and Delimitation of the Research

- Objectives, definitions and delimitation
- Relationship to previous research

Stages of Research

- Formulation of concepts, models, hypotheses and frameworks
- Data collection
- Collection of additional material and complete analysis
- Discussion, interpretation and conclusions

Management of Research Area

- Balanced organisation of the research
- Methodical and logical approach
- Comprehensive and in-depth study
- Independent, critical and profound analysis

Revising the Text

- Layout and presentation
- Language and legibility

Assessment Scale

- improbatur (fail)
- approbatur (lowest passing grade)
- lubenter approbatur
- non sine laude approbatur
- cum laude approbatur
- magna cum laude approbatur
- eximia cum laude approbatur
- laudatur (highest grade)

The student has completed his/her degree **with distinction** if the overall grade is at least 4 and the Master's thesis grade at least eximia cum laude approbatur. In addition to this, at least 40 credits included in the degree must be carried out at LUT and graded on a scale of 1–5.

Publicity of the Study

Master's theses submitted to the university for examination are normally public documents.

This must be mentioned to the commissioner when the topic of the thesis is first discussed. If the thesis includes information which the commissioner considers confidential, the university may agree to hold the thesis **confidential for a maximum of two years**. The confidentiality starts from the date the faculty council assesses the thesis. In such cases, the commissioner must provide the university in writing with a free-form explanation for why confidentiality is required.

If the commissioner requires a period of confidentiality which longer than two years, another version excluding the confidential information must be submitted for publication.

The supervisor of the thesis must see to it that the commissioner is aware of the restrictions to confidentiality in the very beginning of the discussions.

Confidential theses are handled in the faculty council meeting following normal procedure. The faculty council must also have access to the confidential part. The public version of the Master's thesis must mention that the thesis also includes a confidential part. Faculty council members are liable for keeping the information confidential, and the agenda and minutes of the meeting are not to include anything in violation of this confidentiality. The period of confidentiality is to be mentioned in the minutes of the meeting.

In accordance with the faculty council decision of 15 March 2005, this rule can be applied to all Master's theses for which the topic application has been submitted after 1 March 2005.

The only exception are theses with a confidentiality period longer than two years that was agreed on by the employer and supervising professor (or adjunct professor) at an earlier date. Such cases should always be discussed with the supervising (adjunct) professor.

Notice of Confidentiality

If the thesis includes confidential information (held confidential for a maximum of two years), the commissioner of the thesis must submit a written notification of the extent of the confidential information, the reasons for confidentiality and the time the information is to be held confidential (usually in full years). The student is responsible for forwarding the notice to the faculty's study coordinator. The notice is given to the study coordinator along with the assessment application.

The Master's thesis will include the mention "Confidential" and the date the confidentiality expires in the lower right-hand corner of the title page..

Chapters and Layout

The language of the thesis must be grammatically correct and the expression coherent, accurate and concise. It should convey the message to the reader unequivocally and intelligibly, and the organisation should be logical and coherent. Say only what is needed, avoid wordiness. You should particularly avoid buzzwords and unnecessary foreign words.

The Master's thesis is bound in black, hard covers, size A4. The recommended font is Arial 12. The thesis can be printed on both sides of the paper or on one side only. Page margins are as follows: 35 mm at the top, approx. 50 mm on the left, and in one-sided printing approx. 20 mm on the right and at the bottom. Page numbering is at the top of the page, either centred or right-aligned. Spacing is 1.5. If you print on both sides of the paper, the outer margins should be approx. 20 mm and the inner ones approx. 50 mm. Each paragraph is aligned to the left, there are no indentations and there is an empty line between paragraphs. The paragraphs are justified. Avoid long spaces between words: use hyphenation. The thesis should be approximately 80-100 pages.

The text "Master's thesis", the author's name and the year are printed in gold on the spine. The text starts 80 mm from the top and the year is 30 mm from the bottom.

On the front cover, in gold, centred and approx. 100 mm from the top is the word Master's thesis. The author's name and the year are in the lower right-hand corner.

LUT's publication committee recommends that the university's logo be printed in gold in the upper left-hand corner of the cover. A cover template recommended by the publication committee is available on the university web site at www.lut.fi/fi/opiskelu/nykyiset_opiskelijat/ohjeita_opiskeluun.html and in printing presses in Lappeenranta.

If the thesis was a group project, the contributions of each student are bound together in order of content. Each part must contain the author's name and a list of references. The common table of contents must indicate the author of each part. Otherwise, the general guidelines apply also to a group project.

Instructions for Layout and Presentation

The parts of the thesis are organised as follows:

Title page

The title page contains the following information:

- University, Faculty, Major subject
- Title of the Master's thesis
- Examiners (supervisor first)
- date and signature of the author
- Address and telephone (optional)
- Possible period of confidentiality (lower right-hand corner) The confidentiality starts from the date the faculty council assesses the thesis.

The title must be well-defined and correspond to the content of the thesis. A key word, which expresses something essential about the thesis and has an explicit and specific meaning, is recommended as the first word. Avoid the following: some, review, method, report, study, equipment etc.

Abstracts in Finnish and English

The abstract is a concise, objective, independent presentation which can be published separately. It should be intelligible as such, without the original document. It explains the contents of the thesis: the objective, methodologies, results and conclusions. The main method, novel results and

observations, practical importance or theoretical novelty should be presented. The organisation does not need to follow that of the thesis; e.g. the most important result can be introduced upfront. The abstract is no longer than one page. Use short, complete sentences.

The abstract is done in both Finnish and English (equivalent contents). In the Finnish abstract, the title is in Finnish and in the English one in English. Foreign students do not need to prepare an abstract in Finnish.

The wordcount is approximately 100. Both the Finnish and English abstracts are attached to the thesis. They are also submitted to the study coordinator along with the assessment application.

The abstract is a public document, and therefore all confidential information must be excluded from it.

The author sends electronic copies of the abstracts or the entire thesis to the LUT library. More details available from the library and its web site.

You should favour the passive voice or the 3rd person active in case the abstract is published separately. Unestablished abbreviations, symbols or technical terms should be explained. Tables, equations etc. are used only if they are necessary for the sake of clarity. No direct references are made to the original text.

The information below is given at the beginning of the abstract in the following order:

Author's name
Title
Faculty
Major Subject
Year of publication
Master's Thesis. University
Number of pages, figures, tables and appendices
Examiners (supervisor first)
Keywords in Finnish
Keywords in English

An example of how to present the bibliographic information in the abstract:

Abstract:

ABSTRACT

Author: Markkanen, Marja
Title: Activity-based costing in a service enterprise
Faculty: School of Business
Major Subject: **Accounting**
Year: 2000
Master's Thesis: Lappeenranta University of Technology
80 pages, 26 figures, 4 tables and 8 appendices
Examiners: Prof. Timo Tietäväinen
Prof. Tiina Tietäväinen
Keywords: activity-based costing, service enterprise, cost management

The keywords must be informative and describe the contents of the thesis accurately. Concrete concepts (e.g. equipment) are in plural, abstract ones (e.g. methods) in singular. A good title should include at least some of the most important keywords. The number of keywords should be three to five.

Acknowledgements

The possible acknowledgements recognise the help, guidance, advice etc. provided by others and giving thanks to them. Also the commissioner of the thesis is mentioned.

Table of Contents

The table of contents lists the headings and sub-headings and their page numbers. The pages are numbered in Arabic numerals from where the text starts. A separate list of figures and tables can be included at the end of the table of contents.

Decimals and indentations are used in the table of contents – as well as in the headings in the text – according to the following example (note the use of upper and lower case lettering and the indentation of sub-headings). The page numbers are aligned to the right.

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Explanation of Abbreviations and Symbols

Abbreviations and variables and their explanations can be listed in alphabetical order, mathematical and other symbols as a list of their own, and identifying letters as yet another list (latin, greek etc. each separately).

Introduction

The introduction contains an introduction to the topic, definition of the research problem, objectives, point of view, delimitation and research methodology. Different parts can be presented as separate subsections.

Discussion

The discussion is divided into chapters with headings that depict the organisation of the thesis (in exactly the same form as in the table of contents). In this section, the author relates all of the

material he or she wishes in reply to the research questions posed, as well as the conclusions based on the material. Repetition should be avoided, unless it is necessary.

Each citation should be clearly referenced so that the reader may refer to the original source.

The nature of the work determines the form of discussion. The discussion may often be divided into a theoretical part, empirical part and results:

- the theoretical background, including the literature and previous research and concepts on which the thesis is based
- observations and collection of basic material etc In order for the observations to be scientifically valid, the research process should be described in as much detail as possible.
- the discussion on observations and presentation of the results are often closely connected. All calculations need not be shown, as long as the author explicitly explains how they are done.

Figures, tables, equations etc. make the discussion more concrete and enhance readability. They are captioned and numbered, each as their own group.

On the use of technical and mathematical terms and expressions:

- cited expressions and equations must always be referenced unless they can be considered common knowledge You do not need to show how an equation is derived.
- the derivation of new expressions and equations must be presented, or at least its main points. The source of parent equations must be mentioned.
- equations are numbered.

Conclusions and Summary

The conclusions summarise the discussion: the starting point of the research, theoretical and empirical choices, objectives and results, conclusions and possible ideas for further research. You may also voice criticism. There is no need to repeat what has already been said in the discussion. Instead, a more expansive viewpoint can be adopted, explaining which questions were left unanswered etc. New information is not introduced in the conclusions, and no direct references are made to the discussion.

References

Listing references and the related ISO 690.2 and SFS 5342/1987 standard are presented in detail by Mälkiä (1994). If you use more than one source by the same author, the older ones are listed first. If more than one of them are from the same year, they are listed in alphabetical order according to the title and a lower-case letter is added after the year (a, b, c...).

The references may not include sources that are not cited. The sources should be described in detail and in the same way.

Sources are usually referenced as follows:

books author(s), editor(s)
 publication year
 title
 edition (if more than one)
 place of publication
 publisher (NB: not printing press! Excluding company form abbreviations)

Example of source with one author: Patton, M. Q. 1990. Qualitative evaluation and research methods. London: Sage.

Example of source with two authors: Leino, A. & Leino, J. 1988. Kasvatustieteen perusteet. Jyväskylä: Gummerus.

Sources with many volumes are presented in the same way, and the volume in question is also mentioned.

journal papers author(s)
 publication year
 title of paper
 title of journal
 volume (annual set)
 issue
 pages

Example of a source with more than one author: Porter, L. W., Steers, R. M., Mowday, R. T. & Boulian, P. V. 1974. Organizational commitment, job satisfaction, and turnover among psychiatric technicians. *Journal of Applied Psychology*, vol. 59, no. 2, pages 603-609.

publication series author(s)
 publication year
 title of publication
 body in charge
 place of publication
 publisher
 title and number of series

E.g.: Laiho, L. (ed.) 1984. Arctic technology research projects in Finland. Espoo: Valtion teknillinen tutkimuskeskus (VTT). Tiedotteita 331.

final theses author
 year
 title
 type of thesis
 (doctoral dissertation, Master's Thesis etc.)
 institution and department

If you reference a compilation, introduce the parent publication with the word "In:" or type it in capital letters.

For example: Rajala, T. 2000. Henkilöstö kunnan voimavarana. Rajala, T. 2000. Henkilöstö kunnan voimavarana. In: Hoikka, P. (ed.) *Kunnat 2000-luvun kynnyksellä*. 2nd revised ed. Tampere: Tampereen yliopisto.

conference papers
 author
 publication year
 title of paper
 name, place and date of conference
 place of publication
 publisher or conference organiser
 pages

For example: Sandström, J. 2001. How to reduce the complexity when formulating cost information for design engineers? 16th International Conference on Production Research (ICPR), July 23 - August 3, Prague, Czech Republic.

Electric Publications

Electronic sources are referred to according to the SFS 5831 standard. Further information: the library web site www.lut.fi/fi/kirjasto, the library's SFS standard collection and the library administrators. Electronic documents should be referenced only if no other original source exists.

Example of e-mail source:

- Bergman, S. 1996. The Iceland Teacher Training School in the field of biology, science education and development work in environmental education. [e-mail]. stefanb@khi.is 28 June 1996.

Example of Internet source:

- Denning, P. 1996. Business Designs of the New University [online document]. [Accessed 5 June 2007]. Available at <http://ene.grnu.edu/pjd/education.html>

Appendices

Appendices may include equations, diagrams, drawings etc. that do not need to be included in the actual text but to which are referred. Extensive additional reports, large tables and e.g. tables that are referred to often should be appended. However, figures, equations, tables, etc., which are a key part of the text and are also interpreted, are placed in the text.

The heading of an appendix is written at the top of the page. Appendices are numbered. Appendix pages are not numbered; only the final numbered pages of the thesis are part of the table of contents. Appendices and their headings may be listed at the end of the table of contents.

Referencing (citations in the text)

Citations from books, journals, publication series and theses follow the same guidelines as the list of references. Citations include the following: author(s), year, page(s). Thus referencing can be done as follows: "Williamsson (1995, 23-25) states" or (Teece et al. 1986). Mälkiä also discusses citations.

If there is more than one author, the first author's name is followed only by "et al.". This is also how you should cite electronic sources, for instance (Denning 1996). Do not include the web site address – it should be indicated in the list of references. If several sources are referenced at once, they should be separated with a semicolon in parenthesis (;). You should pay attention to where you place the reference. If you want the reference to include the entire preceding paragraph, place it in parenthesis after the final period. If you only want it to include the preceding sentence, place the period after the second bracket. This should also be done within a paragraph. Direct quotations should be in quotes. If you cite the same source twice in a row, the latter can simply be marked: Ibid.

Footnotes are only used for explanations and additional comments on the text and are numbered separately for each page. Footnotes placed at the bottom of the page and separated from the actual text with a line approximately 5 cm long. There should be an empty row above and below the line.

The instructions above are merely guidelines, they are not binding. Referencing can be done in another commonly approved way or following the examiners' instructions. The key to referencing is consistency.

Major subjects may issue their own instructions for authors to follow. Authors must also take into account the requirements set by the language of the thesis.

Further tools in preparing a thesis:

Sirkka Hirsjärvi et al: Tutkimus ja sen raportointi, 1990.

Hirsjärvi - Remes - Sajavaara: Tutki ja kirjoita, 2004.

Mälkiä, Matti: Teksti- ja kirjallisuusviitteiden laatiminen, 1994.

Lappeenranta, 23 May 2007

Ilkka Pöyhönen

Vice-Rector