



Open your mind. LUT.
Lappeenranta University of Technology

Lappeenrannan teknillinen yliopisto
Lappeenranta University of Technology

STUDY PROGRAMMES AND COURSES IN ENGLISH

Study Guide 2011-2012



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STUDY GUIDE 2011-2012

STUDY PROGRAMMES AND COURSES IN ENGLISH

Table of Contents

University of Technology and Economics	4
The University's Academic Year	5
1 Studying at Lappeenranta University of Technology	6
• Study Right and Registration	6
• WebOodi	6
• Registration for Courses	6
• Registration for Exams and Midterms	7
• Noppa	7
• Evaluation of Completed Courses	7
• Regulations on Studies	8
• Degree Certificates	8
2 Study Guidance and Student Support Services	9
• Study Affairs at Faculties	9
• Language Centre	10
• Student Affairs Office	10
• LUT International Services	11
• LUT Career Services	12
• Library	12
• Origo	12
• Study Councillng Psychologist	12
3 Master's Degree Programmes in English at LUT	13
4 Faculty of Technology	15
4.1. Master's Degree Programme in Chemical and Process Engineering	15
• The Aims of the Master's Degree Programme	15
• The Degree Structure of the Programme	16
• Additional Information	18
• The Courses Offered in English	20
4.2 Master's Degree Programme in Energy Technology	36
• Objectives of the Master's Degree Programme	36
• The Degree Structure of the Programme	37
• The Degree Structure for Double Degree Students of Energy Technology	40
• Additional Information	43
• The Courses Offered in English	44
4.3 Master's Degree Programme in Mechanical Engineering	61
• The Aims of the Master's Degree Programme	61
• The Degree Structure of the Programme	61
• Additional Information	64
• The Courses Offered in English	65
4.3 Master's Degree Programme in Technomathematics and Technical Physics	79
• Technomathematics	79
• ECMI Masters in Industrial Mathematics (ECMIMIM) Project	79
• Technical Physics	82
• The Degree Structure for Double Degree Students	83
• Additional Information	84
• The Courses Offered in English	85

5. Faculty of Technology Management	102
5.1. Master's Degree Programme in Information Technology.....	102
• Objectives of the Master's Degree Programme.....	102
• Students Starting are Expected to Have Following Skills	104
• Degree Structure.....	105
5.2. CBU Master's Degree Programme in Information and Communications Technology... 109	
• Degree Structure.....	110
5.3. Fenno-Russian Master's Degree Programme in Information Technology	113
• Degree Structure.....	113
5.4. Courses in English in Information Technology	116
• The Courses Offered in English	116
5.5. Master's Degree Programme in Industrial Management	131
• The Aims of the Master's Degree Programme and Learning Outcomes.....	131
• Professional Scope of the Master's Degree Programme	131
• Fields of Specialisation.....	132
• Degree Structure.....	133
5.6. Joint Master's Degree Programme in Industrial Management	135
5.7. Courses in English in Industrial Management.....	137
• The Courses Offered in English	137
6. School of Business	153
6.1. Master's Degree in International Technology and Innovation Management (MITIM).....	153
6.2. Master's Degree Program (CBU) in Business and Administration, International Technology and Innovation Management (MITIM) Double Degree	155
• The Courses Offered in English.....	156
6.3. Master's Degree in International Marketing Management(MIMM)	176
• The Courses Offered in English	178
6.4. Master's Degree Programme in Strategic Finance (MSF).....	196
• The Courses Offered in English	197
6.5. Student Assessment Policy of School of Business	213
7. The International Business and Technology Management Programme IBTM.....	216
• Autumn Semester 2011.....	216
• Spring Semester 2012.....	234
8. Language Centre Courses 2011 - 2012.....	251
9. Minor subjects in English.....	274
10. University Administration and Professors	278
11. Final Thesis Instructions	283
12. Master's Thesis instructions in Business Administration	296



Open your mind. LUT.
Lappeenranta **University of Technology**

University of Technology and Economics - science across boundaries since 1969

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 2011, over 9 500 LUT students have completed the degree of Master of Science in Technology or Master of Science in Economics and Business Administration. In addition, over 400 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. 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 2011 – 31 July 2012

The periods and exam and intensive course weeks for the academic year 2011-2012:

AUTUMN SEMESTER 2011

Periods

1st 29 Aug. – 14 Oct. 2011
2nd 24 Oct. – 9 Dec. 2011

Intensive Week

Week 42 17 – 21 Oct. 2011

Exam Weeks

Week 34 22 – 26 Aug. 2011
Week 42 17 – 21 Oct. 2011
Week 50 12 – 16 Dec. 2011

SPRING SEMESTER 2012

Periods

3rd 9 Jan. – 24 Feb. 2012
4th 5 Mar. – 27 Apr. 2012

Intensive Weeks

Week 1 2 - 5 Jan. 2012
Week 9 27 Feb – 3 Mar. 2012
Week 19 7 – 11 May 2012

Exam Weeks

Week 1 2 - 5 Jan. 2012
Week 9 27 Feb. – 2 Mar. 2012
Week 14 3 - 5 Apr. 2012 *
Week 18,19,20 2 - 16 and 18 May 2012

Examinations during the teaching periods are arranged according to the examination schedule on Mondays, Tuesdays, Wednesdays and Thursdays from 16:15 to 19:15 (five-hour lectures from 15:15 to 20:15).

On examination weeks in August, October, December, January, March and May, examinations are arranged from Monday to Friday:

8:30-11:30

12:00-16:00 only Language Centre exams

16:15-19:15 (five-hour examinations 15:15-20:15)

***On 3-5 April 2012**, examinations will be arranged 8:30-11:30 and 16:15-20:15 (five-hour exams 15:15-20:15). **No lectures are given during this time.**

Examinations may be arranged on the **Saturdays** 12 November 2011 and 24 March 2012. 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 or wishes to graduate must register as attending and pay the student union membership fee. Students registered as non-attending cannot take part in instruction, exams or cannot graduate.

Registration for the academic year 2011-2012 starts 1 June 2011 and ends 22 August 2011. **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 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 cannot 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 should 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 2011 starts on 1 August 2011, and for courses in the spring semester 2012 on 1 December 2011. Enrolment for each period ends as follows:

Registration for courses in Period 1 ends	Sat, 27 Aug 2011 at 20:00
Registration for courses in Period 2 ends	Mon, 17 Oct. 2011 at 23:59
Registration for courses in Period 3 ends	Mon, 2 Jan. 2012 at 23:59
Registration for courses in Period 4 ends	Mon, 27 Feb. 2012 at 23:59

In the autumn semester, lectures start on 29 August 2011, and in the spring semester on 9 January 2012.

Remember to register for both courses and exams separately.

Registration for Exams and Midterms

The dates of examinations (incl. final exams, midterms, Language Centre written, oral and listening comprehension tests) are available in the examination schedule on the university web site. Students register for examinations through WebOodi.

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

Three examination dates are set for each course. Students may take part in only two of them. Students may choose any two of the exam dates they wish. WebOodi limits the registrations for a final exam for a given course to two times per academic year.

Students who have registered for an exam but are unable to take it must cancel their registration through WebOodi at least two working days before the exam. It is very important that you cancel your registration because each registration is considered an exam taken. If a student is suddenly taken ill after the cancellation deadline and is unable to take the examination, the student must provide a doctor's certificate to the Student Affairs Office in order to be able to retake the exam.

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

In exam sessions according to the examination schedule, students may only take one examination. On special grounds, students can be allowed to take two examinations at the same time. To this end, students must contact the Student Affairs Office at least a week before the exam date.

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 is available at noppa.lut.fi.

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 university Registrar's 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

LUT is a university pursuant to the Universities Act (558/2009).

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. The decree and regulations are available on the university web site.

LUT's regulations on teaching and studying define the framework within which studies are arranged and completed at LUT – how teaching and studies are organised and degrees are completed. The regulations set obligations for both university staff and students. The regulations aim to guarantee students' rights and equal treatment. In addition to students' rights, the regulations naturally include obligations for students.

Disciplinary Measures

LUT accepts no offences against teaching. Offences (e.g. cheat-sheets in exams or plagiarism in assignments or theses) lead to a failing grade and may result in disciplinary measures. Also assisting in an offence is considered an offence. The Universities Act and LUT's regulations on teaching and studying include provisions on disciplinary measures.

A suspected or observed offence is reported to the director of administration and the dean of the student's faculty, and all offences are dealt with.

The rector together with the director of administration decides on the appropriate measure depending on the case. 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. The rector may decide to caution the student, or the matter may be brought before the LUT senate and the student may be suspended for a maximum of one year. As for exchange students and double degree students, the home university may be notified of the offence.

In practice, suspension 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 and will have no study rights. 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

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.

The certificate will show e.g. the graduate's degree, Master's degree programme, major and minor subjects and the name 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. An overall grade is given only when a minimum of 40 ECTS credits in the degree (excluding the Master's thesis) have been completed at LUT and assessed on a scale of 1-5. The overall grades are determined as follows:

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

Degree certificates include transcripts in Finnish and English indicating all courses completed for the degree and their grades. Also major and minor subjects are given an overall grade in the transcript 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 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.

The degree certificates include a Diploma Supplement in English, and at request a transcript of courses completed at LUT but not included in the degree.

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 degree students is provided by study coordinators and study secretaries and for postgraduate students by the head of study affairs.

Study guidance for international degree students:

Ms. Minna Loikkanen, International Study Coordinator, Faculty of Technology
Phone +358 40 824 1096, minna.loikkanen@lut.fi

For more information: 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 serves degree students, doctoral students and LUT staff members in all of the faculty's study affairs matters. Study guidance for degree students is provided by the study coordinator and for postgraduate students by the head of study affairs. Also the study secretaries and student advisers are available.

Study guidance for international degree students:

Ms. Suvi Tiainen, Study Secretary
Phone + 358 40 502 2196, suvi.tiainen@lut.fi

More detailed information on study affairs services and study guidance is available in the Freshman's Survival Guide 2011 by the Faculty of Technology Management.

<http://www.lut.fi/en/technologymanagement/studies/>

Study Affairs at the School of Business

The study affairs' services team of the School of Business assists degree students, doctoral students and LUT staff members in all study affairs matters. Study guidance for degree students is provided by study coordinators and study secretaries and for postgraduate students by the head of study affairs. The study affairs offices of the School of Business are located in the university's 7th building on the 3rd floor.

Contact information:

Ms Minna Ranta
Head of Study Affairs
Phone +358 5 621 7226
E-mail minna.u.ranta@lut.fi

Ms Mailis Heinonen
Coordinator, International Affairs
Phone +358 400 380 265
E-mail mailis.heinonen@lut.fi

More detailed information on study affairs www.lut.fi/kati/lsb.

Study Affairs at the Language Centre

The study affairs services of the Language Centre help students with matters related to language studies related (e.g. enrollment for language courses, registration for language course exams). Study guidance is provided by the student adviser, departmental secretary, teacher adviser and director of language centre. The Language Centre office is located on the 4th floor of the main building, room 14003. Check the contact hours at the Language Centre web page www.lut.fi/kike.

Contact information:

Ms. Jenni Ilmonen, Student Adviser, Language Centre
Phone +358 40 822 8614, office 1412B, kipa.opintoneuvoja@lut.fi

Ms. Tuula Peltonen, Departmental Secretary, Language Centre
Phone +358 5 621 2201, Tuula.peltonen@lut.fi

Ms. Pirjo Rantonen, Teacher Adviser, Language Centre
Phone +358 5 621 2212, pirjo.rantonen@lut.fi

Ms. Vuokko Paakkonen, Director of Language Centre
Phone +358 40 532 5184

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. 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 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.

LUT International Services

The International Services of Lappeenranta University of Technology provide services supporting student and staff mobility.

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 LUT welcomes international exchange students from over 140 partner universities.

International Services coordinate the International Business and Technology Management programme. Both international exchange students and LUT degree students may take courses in the programme.

International Services offer the students guidance and counselling in all international traineeships, while also coordinating Erasmus and IAESTE traineeship programs at LUT.

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

Contact information of International Services:

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

Support Services for Incoming Master's Degree Students and Incoming Exchange Students
Ms Johanna Härkönen, International Study Secretary
Phone +358 40 738 1303
E-mail Johanna.Harkonen@lut.fi

Outgoing Exchange Students
Ms Kaisa Nikku, International Coordinator
Phone +358 40 576 2642
E-mail Kaisa.Nikku@lut.fi

Outgoing & Incoming Trainees
Ms Minna Niemi, International Coordinator
Phone +358 40 738 1312
E-mail Minna.Niemi@lut.fi

LUT Career Services

Career Services offer all the LUT students channels and tools to create contacts with the business world.

Career Services provide students with tools for looking for employment. In practice, this means facilities and tools for searching for information on jobs, employers and looking for work or international internships. Students may use the telephone, copy machine, fax and computers free of charge. Furthermore, Career Services annually organise various recruitment and corporate events where also LUT alumni participate.

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

Contact information of Career Services:

Ms Minna Niemi, Coordinator
Phone +358 40 738 1312
E-mail [Minna.Niemi\(at\)lut.fi](mailto:Minna.Niemi(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.

Origo

Origo provides LUT students a working and study environment complete with information services. Origo houses both the LUT library and the student help desk. 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.

The Origo help desk (www.lut.fi --> Studies --> Helpdesk Origo) provides services over the phone 040 1590 777, by e-mail origo@lut.fi or in person at the fourth floor service desk. The Origo help desk provides students information and communication technology support and assistance in the use of the university's electronic services. The service desk also lends out equipment needed for studies. The Origo help desk also sees to the use of the exam aquarium.

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.

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 Energy Technology
- Master's Degree Programme in Chemical and Process Engineering
- Master's Degree Programme in Mechanical Engineering
- Master's Degree Programme in Technomathematics and Technical Physics
- Master's Degree Programme in Industrial Management
- 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 in International Technology and Innovation Management (MITIM)
- Master's Degree Programme (CBU) in Business and Administration in International Technology and Innovation Management (MITIM) Double Degree
- Master's Degree Programme in International Marketing Management (MIMM)
- Master's Degree Programme in Strategic Finance (MSF)

Measurement of Studies

The studies are measured in ECTS 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 also include 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 societally important topic related to his or her professional field. The Master's thesis is a research project which requires approximately six 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. In the Master's thesis, the student must demonstrate the ability to carry out the project independently and to follow a plan.

Before starting their thesis, students must read the related instructions given by the vice-rector in charge of education. 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 dean of the faculty approves and grades the final 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).

The vice-rector in charge of education issues university-wide general instructions regarding the final thesis. In addition, faculties may also give their own instructions for the theses. The general instructions and the instructions issued by the School of Business can be found at the end of this study guide and on the university web site.

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 ECTS 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 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>Total</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>
BJ20A1801	Chemical Engineering Unit Operations II	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	1-2	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	1	6
BJ30A1600	Advanced Process Simulation	M.Sc. (Tech.) 1	3-4	8
BJ40A0000	Creative Design	M.Sc. (Tech.) 1	1-2	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 traineeship improving expertise.

Major Subjects for Double Degree Students

The Degree Structure for Double Degree Students

Double degree students come from the LUT partner universities. The student takes his Master's degree from both partnering universities, and will be awarded the degree certificate of LUT and the diploma of the home university. The maximum credit transfer to be accepted to the LUT degree from the previous studies in the student's home university is 50 ECTS cr.

Pulp and Paper Technology

The person responsible for the major in Pulp and Paper Technology is professor, D.Sc. (Tech.) Kaj Backfolk

<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	2-3	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

Choose enough credits to attain 70 ECTS credits of major subject studies.

<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	1	6
BJ30A1600	Advanced Process Simulation	M.Sc. (Tech.) 1	3-4	8
BJ40A0000	Creative Design	M.Sc. (Tech.) 1	1-2	3
BM20A3900	Modelling Methodology in Process Engineering	M.Sc. (Tech.) 1	1-2	6

Chemical and Metallurgical Engineering

The person responsible for the 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>
BJ20A1100	Filtration and Mixing	M.Sc. (Tech.) 1	3-4	6
BJ20A1801	Chemical Engineering Unit Operations II	M.Sc. (Tech.) 1	1-2	5
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

18 Chemical and Process Engineering

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>
BJ20A0800 Treatment Processes of Industrial Discharges	B.Sc. (Tech.) 3	3-4	5
BJ20A1901 Advanced Course in Environmental Technology and Unit Operations	M.Sc. (Tech.) 1	3-4	6
BJ30A0700 Computational Fluid Dynamics in Chemical Engineering	M.Sc. (Tech.) 2	1	6
BJ30A1600 Advanced Process Simulation	M.Sc. (Tech.) 1	3-4	8
BJ40A0000 Creative Design	M.Sc. (Tech.) 1	1-2	3
BJ40A0100 Product Design	M.Sc. (Tech.) 1	1-2	5

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

The personal study plan (PSP) is the student's own plan how s/he is going to complete the Master's degree. The degree structure of the Master's programme determines the frame of the studies. At the Master's level, the student makes the PSP by the end of 1st period, and submits it to International Study Coordinator for comments. The electronic personal study plan (ePSP, in Finnish eHOPS) is a tool for drawing the plan up. The students of the Faculty of Technology are recommended to compile the PSP in an electronic form by using the ePSP tool at WebOodi.

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 International Study Coordinator.

Complementary Studies

The student with a Finnish degree from the University of Applied Sciences or equivalent may have to study complementary studies. The extent of these studies depends on the content of the previous degree. More information is available from International Study Coordinator.

Traineeship

A traineeship in the Master's degree can be worth 6 ECTS credits. A two-week full traineeship is worth one ECTS credit. The traineeship is approved by traineeship coordinator.

Maturity Test

The student must take a maturity test to show how well s/he knows the topic of the Master's thesis. The test evaluates the student's familiarity with the theories and problems of the thesis. The student is asked to contact the supervising professor to agree how the maturity test is taken, that is, as a seminar presentation or as a written test. The maturity test is evaluated on a scale of passed/failed by the supervising professor of the thesis.

Further Information

Programme Coordinator:

Professor, Ph.D. Andrzej Kraslawski

Phone +358 5 621 2139, andrzej.kraslawski(at)lut.fi

International Study Coordinator, Faculty of Technology:

Ms. Minna Loikkanen

Phone +358 40 824 1096, minna.loikkanen(at)lut.fi

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 ¹	Chemical Engineering Unit Operations I	1-2	4

¹ literature exam: Coulson&Richardson, Chemical Engineering (particular chapters)

<i>Obligatory Studies, choose one course:</i>		<i>per.</i>	<i>ECTS cr</i>
BJ30A0600	Modelling of Unit Processes	3-4	6
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

<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
BJ20A1801	Chemical Engineering Unit Operations II	1-2	5
BJ20A1901	Advanced Course in Environmental Technology and Unit Operations	3-4,1	6

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
BJ20A1801	Chemical Engineering Unit Operations II	5
BJ20A1901	Advanced Course in Environmental Technology and Unit Operations	6
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
BJ40A0300	Management of Technical Information in Export of Processing Equipment to Russian Federation	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.	
Aims	Person in Charge: Head of the Laboratory Upon completion of the module, the student will be able to:	
Content	- carry out independently a small research project (the contents of the module varies substantially). 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. Hours of self study varies.	
Evaluation	0-5 or pass/fail, depending on the project carried out.	
Study materials	Literature related to the project.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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	Upon completion of the module, the student will be able to:	
Content	- define a restricted research problem or design task - select appropriate methods for a restricted research problem or design task in the field - can find and use critically data, information and knowledge in the field, and estimate their reliability - apply his/her chemical engineering knowledge to solve a restricted research problem or carry out a design task - apply his creativity to find new solutions or in best case to generate new technology - report the results orally and participate in a scientific discussion - write a report from the task according to scientific principles.	
Modes of Study	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.	
Evaluation	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. 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)
Aims	Upon completion of the module, the student will be able to: - interpret the documents describing process control, measurement and automation - describe the basic principles and methods in process control, measurement and automation - define the control and measurement needs of a process.
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. Individual or team project work with supervision 12 h, 2nd period. Self study 38 h.
Evaluation	0-5, written examination 60%, project work 40%.
Study materials	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. Blackboard.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.
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	Upon completion of the module, the student will be able to: - communicate and work in an international project or team.
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.

Evaluation	Self study 20 h. No examination.
Study materials	The number of participants is limited. Priority is given to the students of the Master's Degree Programme in Chemical and Process Engineering (IPPE). Pass/Fail. Active participation in lectures and exercises. Blackboard.
BJ20A0301	INTRODUCTION TO PROCESS SIMULATION 5 ECTS cr
	Introduction to Process Simulation
Year and Period	B.Sc. (Tech.) 3, Period 1-2
Teacher(s)	Associate Professor, D.Sc. (Tech.) Ritva Tuunila
Aims	After a module a student can: - explain basics of process simulation - can draw an information (simulation) flowsheet - can choose decision parameters and define iterative streams of the process - explain a basic structure of a process simulator - 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. Simulation exercises 21 h, 2nd period. Individual assignments 45 h, 2nd period. Self study 36 h.
Evaluation	0-5, exam 80%, assignments 20%.
Study materials	Biegler, L. T., Grossmann, I. E., Westerberg, A. W.: Systematic Methods of Chemical Process Design, Prentice Hall PTR, 1997 (where applicable). Course notes and other lecture materials. Blackboard.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi
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)	Docent, Ph.D. Sergei Preis
Aims	After a module a student can: - list, define and explain the most important methods and equipment used for water, wastewater and air emissions treatment, and solid waste processing and disposal - suggest and evaluate suitable treatment methods and their combinations for solving different kinds of environmental problems - search, summarize and report data extracted from the literature concerning the environmental techniques and technology - size the equipment for settling processes in water treatment.
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.

24 Chemical and Process Engineering

Evaluation	Lectures and exercises 21 h, 4th period. Self study 88 h.
Study materials	0-5, written examination 100%. 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 Kemiantekniikan yksikköoperaatiot I
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.

BJ20A1100	FILTRATION AND MIXING	6 ECTS cr
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Antti Häkkinen Associate Professor, D.Sc. (Tech.) Ritva Tuunila Docent, D.Sc. (Tech.) Tuomas Koiranen Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen Docent, Ph.D. Sergei Preis Person in Charge: Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen	
Aims	Filtration part: A student can: <ul style="list-style-type: none">- list different methods and equipment used for solid-liquid separation- choose and size suitable equipment for separation process based on knowledge of the suspension and data from laboratory tests- explain the effects of characteristics of solid material and liquid to the separation and post treatment process- define different filter media used in filters and select preliminary a type of medium for different cases- perform an experimental test in a laboratory- write a scientific report. Mixing part: A student can: <ul style="list-style-type: none">- apply obtained understanding of fluid dynamics and rheology- select different mixing device (stirred tanks, static mixers, inline mixers) for a specific application such as blending of liquids and mixing of solids and mixing of multi-phase systems (gas-liquid, liquid-liquid, solid-liquid and gas-solid-liquid systems)- size and scale up the basic blending device- model heat transfer of mixing device	
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. Filter medium. Mixing: fundamentals of mixing, rheology, mixing equipment, design of mixers and scale-up.	
Modes of Study	Lectures 18 h, exercises 18 h, filtration laboratory work 20 h, 3rd period. Lectures 9 h, exercises 9 h, mixing case study 10 h, 4th period. Self study 72 h.	
Evaluation	0-5, written examination 80%, laboratory work and case study work 20%.	
Study materials	Additional material will be informed at lectures. Blackboard.	
Prerequisites	BJ20A0100 Mekaaniset erotusmenetelmät passed.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

BJ20A1801	CHEMICAL ENGINEERING UNIT OPERATIONS 5 ECTS cr II
	Chemical Engineering Unit Operations II
	Replaces the course BJ20A1800 Chemical Engineering Unit Operations IIB.
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Teacher(s)	Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen Associate Professor, D.Sc. (Tech.) Harri Niemi Person in Charge: Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen
Aims	After a module a student can: - explain the fundamentals of multicomponent mass transfer and the differences between binary and multicomponent mass transfer - explain the mass transfer phenomena in membrane separation processes - list and describe the operation of the most important equipment and membrane types used for industrial membrane processes - estimate the number of required membrane modules for a given separation task by utilizing mass transfer modeling and process simulation - explain the fundamentals of industrial crystallization (kinetics, solid-liquid equilibrium, population density, crystal size distributions, polymorphism, solvate and hydrate formation, mass transfer in crystallization and dissolution, realtime process monitoring) - list and describe the operation of the most important industrial crystallizers - estimate preliminary size of a MSMPR crystallizer.
Content	The topics are as follows: 1. 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. 2. Membrane separation: Mass transfer, modelling, process design, simulation of industrial membrane processes. 3. Industrial crystallization: theory, operation and design of crystallizers. Mass transfer of dissolution.
Modes of Study	Lectures 18 h, exercises 42 h, laboratory work 10 h, Matlab case studies, 1st-2nd period. Self study 70 h.
Evaluation	0-5, exam 80%, assignments 20%.
Study materials	Davey, R. J., Garside, J., From Molecules to Crystallizers, Oxford, Oxford University Press, 2000. Lecture notes.
Prerequisites	BJ20A1600 Kemiantekniikan yksikköoperaatiot I and BJ80A1000 Kemiallinen termodynamiikka passed.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.
BJ20A1901	ADVANCED COURSE IN ENVIRONMENTAL TECHNOLOGY AND UNIT OPERATIONS 6 ECTS cr
	Advanced Course in Environmental Technology and Unit Operations
	Replaces the course BJ20A1900 Advanced Course in Environmental Technology and Unit Operations.
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Teacher(s)	Docent, Ph.D. Sergei Preis Professor, D.Sc. (Tech.) Antti Häkkinen Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen Associate Professor, D.Sc. (Tech.) Harri Niemi

26 Chemical and Process Engineering

Aims	Associate Professor, D.Sc. (Tech.) Ritva Tuunila Person in Charge: Professor, D.Sc. (Tech.) Marjatta Louhi-Kultanen After a module a student can: - select sustainable unit operations - select appropriate water treatment methods for challenging pollutants among Advanced Oxidation Processes - select sustainable chemicals (reactants, solvents) and processes to avoid chemical and energy losses, and to minimize emissions - explain the concept and the application of the product and process life cycle analysis - search and use the literature valid for the field on selected topics on separation and environmental technology - produce a clear technical and scientific written report - present research results in front of audience clearly and compactly - make constructive peer assessment (acting as an opponent in seminar, reviewing the reports of other students).
Content	Sustainable chemical engineering in technology and in treatment of industrial and municipal wastes. Case studies of various unit operations and green chemistry applications.
Modes of Study	Lectures 12 h, 3rd period. Seminars 16 h, 4th period. Self study 128 h.
Evaluation	Literature review or experimental/simulation work, report and seminar presentation. The student has to attend 80% of seminar presentations. 0-5, exam 30%, assignments 70%.
Study materials	Lecture notes.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.

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	Upon completion of the module, the student will be able to: - apply his chemical engineering knowledge to real industrial process design project - perform technical and economical design calculations - solve real design problems sometimes starting from limited and incomplete initial information - seek and create novel solutions to design problems.
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.
Evaluation	0-5, design reports 100%.
Prerequisites	BJ30A0303 Prosessi- ja tehdassuunnittelu passed. Recommended BJ30A0400 Prosessisuunnittelun seminaari.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

BJ30A0700	COMPUTATIONAL FLUID DYNAMICS IN CHEMICAL ENGINEERING	6 ECTS cr
	Computational Fluid Dynamics in Chemical Engineering	
Year and Period	M.Sc. (Tech.) 2, Period 1	
Teacher(s)	Docent, D.Sc. (Tech.) Arto Laari Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	Upon completion of the module, the student will be able to: - understand theoretical basis of computational fluid dynamics - use CFX-software in computational fluid dynamics - identify the most potential application areas of computational fluid dynamics in chemical engineering - apply computational fluid dynamics to some chemical engineering problems e.g. in equipment design or 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, 1st 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. Blackboard.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	
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 Associate Professor, D.Sc. (Tech.) Ville Ojanen Associate Professor, D.Sc. (Tech.) Kimmo Kerkkänen Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	Upon completion of the module, the student will be able to: - explain typical methods, problems and their solution in the generation of innovations an novel technology - carry out interdisciplinary teamwork in international environment - apply typical methods of process and product development.	
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. Self study 212 h. Independent project and teamwork in groups of 4-8 students.	
Evaluation	0-5, project work 100%.	
Study materials	Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BJ30A1600	ADVANCED PROCESS SIMULATION	8 ECTS cr
	Advanced Process Simulation	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Part-time Untenured Teacher, D.Sc. (Tech.) Yury Avramenko	
Aims	Person in Charge: Professor, Ph.D. Andrzej Kraslawski Upon completion of the module, the student will be able to:	
	<ul style="list-style-type: none"> - represent the process flowsheet in digital form based on textual process description or printed flow diagram - draw the process diagrams using available widely used software like MS Visio - work with simulation software: mainly BALAS and ASPEN Plus – however, the skills can be applied for other simulation software - translate the real process unit operations to model blocks of simulation software with adjustment of important parameters - carry out teamwork during fulfilment of complex computational projects. 	
Content	Introduction to process modeling and process simulation. Levels of process representation and reading process diagrams. Overview of existing simulation 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. Self study 46 h.	
Evaluation	0-5, project 60%, class work 40%.	
Study materials	Lecture notes, BALAS and ASPEN Plus manuals.	
Prerequisites	BJ20A0301 Introduction to Process Simulation	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BJ40A0000	CREATIVE DESIGN	3 ECTS cr
	Creative Design	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Andrzej Kraslawski	
Aims	Upon completion of the module, the student will be able to:	
	<ul style="list-style-type: none"> - describe the types of innovation - explain the concept and models of creativity - apply several creativity techniques to real problems. 	
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. Self study 22 h.	
Evaluation	0-5, written examination 50%, exercises and presence at the lectures 50%.	
Study materials	Lecture notes.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BJ40A0100	PRODUCT DESIGN	5 ECTS cr
	Product Design	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, Ph.D. Andrzej Kraslawski	
Aims	Upon completion of the module, the student will be able to	
	<ul style="list-style-type: none"> - describe different product types - explain stages and methods of product development 	

Content	- carry out computer-aided product design. 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, 1st period. Self study 95 h.
Evaluation	0-5, written examination 50%, exercises and presence at the lectures 50%.
Study materials	Lecture notes.

BJ40A0300	MANAGEMENT OF TECHNICAL INFORMATION 5 ECTS cr IN EXPORT OF PROCESSING EQUIPMENT TO RUSSIAN FEDERATION
	Management of Technical Information in Export of Processing Equipment to Russian Federation
Year and Period	M.Sc. (Tech.) 1, Period Intensive
Teacher(s)	Professor, Ph.D. Andrzej Kraslawski N.N. (St. Petersburg State Mining Institute) N.N. (St. Petersburg Plant Polymers University) Person in Charge: Professor, Ph.D. Andrzej Kraslawski
Aims	Upon completion of the module, the student will be able to: - explain technical and organizational aspects of exporting processes and equipment to Russian Federation.
Content	Technical documentation needed for export of basic processing equipment to Russian Federation (safety, environment, technical norms, role of climatic regions). Differences between the European and Russian norms and standards for the processing equipment. Flow of documents between the EU companies and Russian institutions (e.g. Rostekhnadzor) and certification organizations. Examples of exporting the processing equipment for chemical, mineral and pulp & paper industry.
Modes of Study	Intensive course. Lectures 28 h, exercises 28 h, intensive weeks 9 and 18.
Evaluation	Several projects. No examination. Self study 74 h.
Study materials	0-5, active participation in lectures and exercises. Successful project works.
Further Information	Lecture notes. This course has 11-15 places for open university students. More information on the web site for open university instruction.

BJ50A0400	ADVANCED COURSE IN MEMBRANE TECHNOLOGY AND TECHNICAL POLYMER CHEMISTRY	10 ECTS cr
	Membranitekniiikan 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 Postdoctoral Researcher, D.Sc. (Tech.) Mari Kallioinen	
Aims	At the end of the course a student is expected to know in the project-like research work how to: - draw up a research plan for the assigned topic - perform high quality measurements - interpret results and draw conclusions based on them - report in writing and orally.	
Content	Membrane processes and their special characters, optimization and characterization of materials. Exploitation of polymeric materials. Yearly	

30 Chemical and Process Engineering

Modes of Study	changing project subjects. Lectures, seminars and personal guidance 8 h, 1st period. Lectures, seminars and personal guidance 8 h, 2nd period. Personal research project 165 h laboratory work and reporting, 1st–2nd period. Self study 75 h. Lectures, laboratory work, seminar lectures and possibly a test. Obligatory seminars. Enrolling to the course using the WebOodi but also in the laboratory's noticeboard preferably on preceding spring.
Evaluation	0-5, personal laboratory research work 25%, seminars 75%.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BJ60A1000	FIBER AND PAPER TECHNOLOGY; PERSONAL ASSIGNMENT	6 ECTS cr
	Fiber and Paper 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.) Kaj Backfolk University Lecturer, Lic.Sc. (Tech.) Kati Turku University Lecturer, M.Sc. (Tech.) Mika Pulkkinen	
Aims	After a module a student can: - apply obtained understanding of a specialized area of fiber, paper or coating technology or paper chemistry - perform individual literature assignment and seminar presentation on a specified subject - search information on given topic - write a scientific literature review.	
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. Independent literature search and preparing of a scientific literature review about given topic. Seminar presentation. Project meetings 6 h, 3rd-4th period/1st-2nd period. Seminars 10 h, 4th/2nd period. Self study 140 h.	
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	
	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.) Kaj Backfolk University Lecturer, Lic.Sc. (Tech.) Kati Turku Person in Charge: Professor, D.Sc. (Tech.) Kaj Backfolk	
Aims	After a module a student can: - apply obtained understanding of a specialized area of fiber, paper or coating	

Content	technology or paper chemistry - perform individual assignment including experimental and literature parts and seminar presentation on a specified subject - search information on given topic - analyse results of the laboratory experiments - write a scientific report.
Modes of Study	An individual and independent assignment with supervision on fiber, paper or coating technology or paper chemistry including literature review and experimental part. Suitable also for postgraduate studies. The course is held both during the autumn and the spring semester. Independent literature search and preparing of a scientific literature review about the given topic. Planning and performing an individual research work about the given topic. Writing a final report consisting the literature review and research work. Seminar presentation. Project meetings and supervised processing of the assignment 30 h, 3rd-4th period/1st-2nd period. Seminars 10 h 4th/2nd period. Self study 220 h.
Evaluation	0-5, consists of the performing of the research work, final report and seminar.
Study materials	Literature related to the project. Course material.
Prerequisites	BJ60A0001 Paperitekniiikan perusteet and BJ60A0800 Kuitu- ja paperitekniiikan laboriotyöt 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	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Teacher(s)	Professor, D.Sc. (Tech.) Kaj Backfolk University Lecturer, M.Sc. (Tech.) Mika Pulkkinen University Lecturer, Lic.Sc. (Tech.) Kati Turku Visiting lecturer(s)	
Aims	Person in Charge: Professor, D.Sc. (Tech.) Kaj Backfolk After a module a student can: - explain how the properties of paper are linked to its structure and its manufacturing process - explain the most typical uses of paper and how various properties of paper are taken advantage of in various end uses - categorize 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. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, 2nd period. Lectures 28 h, 3rd period. Self study 74 h. Blackboard support.	
Evaluation	Seminar presentation and a written report. Examination.	
Study materials	0-5, the grade consists of the examination and the seminar work. Lectures and lecture material (Noppa/Blackboard). 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	BJ60A0001 Paperitekniiikan perusteet and BJ60A0900 Kuidun ja paperin valmistus or BJ60A1500 Fiber and Paper Basics or corresponding knowledge	

32 Chemical and Process Engineering

Further Information	of forest industry. BJ80A0500 Pinta- ja kolloidikemia is recommended. This course has 11-15 places for open university students. More information on the web site for open university instruction.
BJ60A1400	CHEMICAL PULPING TECHNOLOGY 5 ECTS cr
	Chemical Pulping Technology
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Teacher(s)	Lic.Sc. (Tech.) Tapio Tirri Doctoral Student, M.Sc. (Tech.) Katriina Mielonen
Aims	After a module a student can: - list 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 - define energy and mass balances and mill emissions.
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. Self study 102 h. Examination. Blackboard-support.
Evaluation	Lectures, personal assignment and seminar. 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.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.
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.) Kaj Backfolk D.Sc. (Tech.) Päivi Rousu University Lecturer, Lic.Sc. (Tech.) Kati Turku University Lecturer, M.Sc. (Tech.) Mika Pulkkinen Visiting lecturers
Aims	Person in Charge: Professor, D.Sc. (Tech.) Kaj Backfolk After a module a student can: - categorize pulping and papermaking processes - define properties of paper and board - explain principles of paper technical laboratory work and methods of analysis used in the paper industry.
Content	Chemical and mechanical pulp, recycled fiber. Basic properties of papermaking fibres: structure, interactions with water and bonding. Filtration of fibre

Modes of Study	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. Lectures 21 h, 1st period. Guided laboratory work 30 h and report, 1st-2nd period. Self study 53 h. Examination.
Evaluation	Support on web-based learning environment platform (Blackboard).
Study materials	0-5, exam 100% and passed laboratory work. Lectures. Course material on Blackboard. Other literature given on lectures.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BJ90A0400	CATALYSIS	4 ECTS cr
	Catalysis	
	The course will be lectured every other year, next during the academic year 2012 - 2013.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Erkki Paatero	
Aims	After a module a student can: - explain the basics of homogeneous catalysis - explain the basics of heterogeneous catalysis - explain how the catalysts work in chemical reactors - explain the basic mechanisms of catalytic reactions - make a preliminary catalyst selection - carry out some catalyst characterization experiment.	
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. Self study 70 h.	
Evaluation	Laboratory demonstration and homework.	
Study materials	0-5, written examination 100%, homework passed. 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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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 Lecturer, D.Sc. (Tech.) Tuomo Sainio Senior Assistant, D.Sc. (Tech.) Kimmo Klemola	
Aims	After a module a student can:	

34 Chemical and Process Engineering

Content	<ul style="list-style-type: none">- list the main chemical separation methods- name industrial uses of the chemical separation methods- give oral presentation of a scientific topic- use scientific search engines. <p>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 especially in hydrometallurgy, food industry, pharmaceutical industry and chemical industry. Suitable also for postgraduate studies.</p>
Modes of Study	Lectures and seminars 28 h, 3rd period. Lectures and seminars 7 h, 4th period. Self study 60 h. Oral presentation of a literature study. Written examination.
Evaluation	0-5, examination 80%, seminar presentation 20%.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

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 Senior Lecturer, D.Sc. (Tech.) Tuomo Sainio	
Aims	After a module a student can: <ul style="list-style-type: none">- list the main chemical separation methods- name industrial uses of the chemical separation methods- give oral presentation of a scientific topic- make a scientific report- use scientific search engines- perform a laboratory experiment and use some analyzing instruments.	
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 especially in hydrometallurgy, food industry, pharmaceutical industry and chemical industry. The students have a possibility to get training in scientific reporting and oral presentation.	
Modes of Study	Lectures and seminars 28 h, 3rd period. Lectures and seminars 14 h, 4th period. Oral and written presentation of a literature study. Laboratory work of approximately 40 h. Self study 100 h. Written examination.	
Evaluation	0-5, examination 70%, report 20% and seminar presentation 10%.	

BJ90A1100	HYDROMETALLURGY	4 ECTS cr
	Hydrometallurgy	
	The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Erkki Paatero	
Aims	After a module a student can: <ul style="list-style-type: none">- explain the fundamentals of hydrometallurgy	

	<p>- list the most important methods and equipment used for hydrometallurgical processes</p>
Content	<p>- name real industrial hydrometallurgical cases worldwide. 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.</p>
Modes of Study	<p>Intensive course. Lectures and exercises 28 h, 1st-2nd period. Self study 75 h.</p>
Evaluation	<p>0-5, written examination 100%, exercises passed.</p>
Study materials	<p>Fathi Habashi, Textbook of Hydrometallurgy, Metallurgie Extractive Quebec, 2nd edition, 1999.</p>
Further Information	<p>This course has 1-5 places for open university students. More information on the web site for open university instruction.</p>

4.2. Master's Degree Programme in Energy Technology

The Master's Degree Programme in Energy Technology includes a wide array of advanced energy studies. From a broad energy perspective comprising the disciplines of renewable energy technology, environmental energy technology and management, nuclear energy engineering, electrical drives technology and control engineering, and electricity market and power systems, the Degree Programme focuses on professional competence and provides students with various study options to specialize in their fields of interest.

The programme takes two years, corresponds to 120 ECTS credits and leads to the degree of Master of Science in Technology.

Objectives of the Master's Degree Programme

The Master's Degree Programme in Energy Technology is specifically aimed at students who wish to receive versatile and target-oriented training in energy technology. The objective of the programme is that students graduating from the programme are professionally and academically prepared to address the needs of international enterprises that are seeking for networking opportunities in a global market.

The educational objective of the Master's Degree Programme in Energy Technology is to train industrially oriented 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 Energy Technology – 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.
- Nuclear Energy Engineering – provides studies in design, operation and basic structures of nuclear power plants, modeling and optimization of nuclear systems, radiation and nuclear safety as well as radioactive waste management.
- Industrial Electronics – includes studies in electrical drives technology and control engineering, focusing on electromagnetism, power electronics, electromechanical and electrothermal processes, industrial applications of real-time control systems, embedded systems, digital signal processing, and on the application of these to the modeling and control of electrical drives and power electronics.
- Electricity Market and Power Systems – focuses on studies in electricity transmission and distribution technology, electricity market and electricity distribution business.

The Degree Structure of the Programme

Master's Degree Programme in Energy Technology 120 ECTS cr						
Master's Thesis on major subject 30 ECTS credits						
Major Subjects (60-66 ECTS cr):					Minor Subjects (20-22 ECTS cr):	
Master of Science (Technology)	Environmental Energy Technology	Bio-Energy Technology	Nuclear Energy Engineering	Industrial Electronics	Electricity Market and Power Systems	- Bio-Energy Technology - Environmental Energy Technology - Industrial Embedded Systems - Power Electronics and Electrical Drives - Modelling of Energy Systems
	General studies 16 ECTS cr					Elective studies 16-24 ECTS cr

Degree Structure

General Studies	16	ECTS cr
Major Subject	60-66	ECTS cr
Minor Subject	20-22	ECTS cr
Elective Studies	16-24	ECTS cr
<i>Total</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

General Studies

<i>Obligatory Studies (16 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A1300 Complex Analysis	M.Sc. (Tech.) 1-2	1	3
BM20A2701 Numerical Methods II	M.Sc. (Tech.) 1	3	3
FV11A6500 Presenting in English	B.Sc. (Tech.) 2-3	1, 2,	2
	B.Sc. (Econ. & Bus. Adm.) 2-3	3, 4	
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3	1-2,	4
	M.Sc. (Tech.) 1-2	3, 3-	
	B.Sc. (Econ. & Bus. Adm.) 3	4, 5	
	M.Sc. (Econ. & Bus. Adm.) 1-2		
FV18A9101 Finnish 1		1, 3	2
FV18A9201 Finnish 2		2, 4	2

38 Energy Technology

Major Studies

1. Major Subject in Industrial Electronics

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

Obligatory Studies (66 ECTS cr)		year	per.	ECTS cr
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
BL30A1001	Electrical Drives	M.Sc. (Tech.) 2	2-3	8
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
BL10A2000	Master's Thesis and Seminar			30

2. Major Subject in Electricity Market and Power Systems

The person responsible for major in Electricity Market and Power Systems is professor, D.Sc. (Tech.) Jarmo Partanen

Obligatory Studies (61 ECTS cr)		year	per.	ECTS cr
BH50A1200	Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BH60A2000	Emission Trading	M.Sc. (Tech.) 1	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	1-2	8
BL30A0600	Power Electronics	M.Sc. (Tech.) 1	1-2	6
BL10A2000	Master's Thesis and Seminar			30

3. Major Subject in Bio-Energy Technology

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

Obligatory Studies (60 ECTS cr)		year	per.	ECTS cr
BH40A1301	Power Machines 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.) 2	1-2	6
BH50A1500	Bioenergy Technology Solutions	M.Sc. (Tech.) 1	2-3	6
BH61A0600	Bioenergy	M.Sc. (Tech.) 1	1	3
BH10A1100	Master's Thesis and Seminar			30

4. Major Subject in Nuclear Energy Engineering

The person responsible for major in Nuclear Energy Engineering is professor, D.Sc. (Tech.) Riitta Kyrki-Rajamäki

Obligatory Studies (62 ECTS cr)		year	per.	ECTS cr
BH30A1400	Nuclear Engineering I	M.Sc. (Tech.) 1	1-2	6
BH30A1500	Nuclear Engineering II	M.Sc. (Tech.) 1	3-4	5
BH30A1600	Nuclear Reactor Physics	M.Sc. (Tech.) 2	2-3	6
BH50A1200	Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BH50A1300	Maintenance Management	M.Sc. (Tech.) 2	1-2	4
BH60A1600 [†]	Basic Course on Environmental Management and Economics	B.Sc. (Tech.) 2	1-2	5
BL20A0401 [†]	Electricity Market	M.Sc. (Tech.) 1	1	5
BH10A1100	Master's Thesis and Seminar			30

[†] Alternative courses

5. Major Subject in Environmental Energy Technology

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

<i>Obligatory Studies (60 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH40A1301	Power Machines in Renewable Energy	M.Sc. (Tech.) 2	2	5
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
BH60A2101	Advanced Course in Life Cycle Assessment	M.Sc. (Tech.) 2	1-2	7
BH60A2200	Air Pollution Control	M.Sc. (Tech.) 1	3-4	3
BH60A2401	Energy Recovery from Solid Waste	M.Sc. (Tech.) 2	1-2	4
BH61A0600	Bioenergy	M.Sc. (Tech.) 1	1	3
BH10A1200	Master's Thesis and Seminar			30

Minor Studies

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.

Subject combination	
Major Subject	Minor Subject
Industrial Electronics	Industrial Embedded Systems
Electricity Market and Power Systems	Power Electronics and Electrical Drives
Environmental Energy Technology	Bio-Energy Technology
Bio-Energy Technology	Environmental Energy Technology Modelling of Energy Systems
Nuclear Energy Engineering	Environmental Energy Technology Modelling of Energy Systems Bio-Energy Technology

1. Minor Subject in Industrial Embedded Systems

<i>Obligatory Studies (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

2. Minor Subject in Power Electronics and Electrical Drives

<i>Select a minimum of 20 ECTS cr</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
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

40 Energy Technology

3. Minor Subject in Bio-Energy Technology

<i>Obligatory Studies (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.) 2	1-2	6
BH50A1600	Waste Heat Recovery Techniques	M.Sc. (Tech.) 2	3-4	6
BH50A1500	Bioenergy Technology Solutions	M.Sc. (Tech.) 1	2-3	6

4. Minor Subject in Environmental Energy Technology

<i>Obligatory Studies (22 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	M.Sc. (Tech.) 1	3-4	3
BH60A2101	Advanced Course in Life Cycle Assessment	M.Sc. (Tech.) 2	1-2	7
BH60A2200	Air Pollution Control	M.Sc. (Tech.) 1	3-4	3
BH60A2401	Energy Recovery from Solid Waste	M.Sc. (Tech.) 2	1-2	4

5. Minor Subject in Modelling of Energy Systems

<i>Obligatory Studies (21 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH40A1500	Turbulence Models	M.Sc. (Tech.) 2	3-4	4
BH70A0001	Numerical Methods in Heat Transfer	M.Sc. (Tech.) 1	1-2	6
BH70A0101	Advanced Modeling Tools For Transport Phenomena	M.Sc. (Tech.) 1	3-4	5
BH70A0200	Advanced Topics in Modelling of Energy Systems	M.Sc. (Tech.) 1	1-2	6

Elective Studies

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 traineeship improving expertise.

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.

The Degree Structure for Double Degree Students of Energy Technology

Double degree students come from the LUT partner universities. The student takes his Master's degree from both partnering universities, and will be awarded the degree certificate of LUT and the diploma of the home university. The maximum credit transfer to be accepted to the LUT degree from the previous studies in the student's home university is 50 ECTS cr.

1. Major Subject in Industrial Electronics

Degree Structure		
Major Subject (amount of ECTS depends on specialisation)	57-66	ECTS cr
Elective Studies	4-13	ECTS cr
Credit transfer from studies at home university, a max. of 50 ECTS	50	ECTS cr
Credits	120 (min.)	ECTS cr

<i>Obligatory to All (48 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH50A1200	Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BL30A0600	Power Electronics	M.Sc. (Tech.) 1	1-2	6
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4
BL50A0600	Electromagnetic Compatibility in Power Electronics	M.Sc. (Tech.) 1	1	2
BL10A2000	Master's Thesis and Seminar			30

<i>Obligatory to Students Specialising in Electrical Machine (18 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BL30A0400	Design of an Electrical Machine	M.Sc. (Tech.) 1	1	6
BL30A1001	Electrical Drives	M.Sc. (Tech.) 2	2-3	8
BL30A1200	Numerical Methods in Electromagnetism	M.Sc. (Tech.) 2	3	4

<i>Obligatory to Students Specialising in Control Engineering (9 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

2. Major Subject in Electricity Market and Power Systems

Degree Structure		
Major Subject	61	ECTS cr
Elective Studies	9	ECTS cr
Credit transfer from studies at home university, a max. of 50 ECTS	50	ECTS cr
Credits	120 (min.)	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	M.Sc. (Tech.) 1	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	1-2	8
BL30A0600	Power Electronics	M.Sc. (Tech.) 1	1-2	6
BL10A2000	Master's Thesis and Seminar			30

3. Major Subject in Bio-Energy Technology

Degree Structure		
Major Subject	60	ECTS cr
Elective Studies	10	ECTS cr
Credit transfer from studies at home university, a max. of 50 ECTS	50	ECTS cr
Credits	120 (min.)	ECTS cr

<i>Obligatory Studies (60 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH40A1301	Power Machines 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.) 2	1-2	6
BH50A1500	Bioenergy Technology Solutions	M.Sc. (Tech.) 1	2-3	6
BH61A0600	Bioenergy	M.Sc. (Tech.) 1	1	3
BH10A1100	Master's Thesis and Seminar			30

4. Major Subject in Nuclear Energy Engineering

Degree Structure		
Major Subject	62	ECTS cr
Elective Studies	8	ECTS cr
Credit transfer from studies at home university, a max. of 50 ECTS	50	ECTS cr
Credits	120 (min.)	ECTS cr

<i>Obligatory Studies (62 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH30A1400	Nuclear Engineering I	M.Sc. (Tech.) 1	1-2	6
BH30A1500	Nuclear Engineering II	M.Sc. (Tech.) 1	3-4	5
BH30A1600	Nuclear Reactor Physics	M.Sc. (Tech.) 2	2-3	6
BH50A1200	Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BH50A1300	Maintenance Management	M.Sc. (Tech.) 2	1-2	4
BH60A1600 [†]	Basic Course on Environmental Management and Economics	B.Sc. (Tech.) 2	1-2	5
BL20A0401 [†]	Electricity Market	M.Sc. (Tech.) 1	1	5
BH10A1100	Master's Thesis and Seminar			30

[†] Alternative courses

5. Major Subject in Environmental Energy Technology

Degree Structure		
Major Subject	60	ECTS cr
Elective Studies	10	ECTS cr
Credit transfer from studies at home university, a max. of 50 ECTS	50	ECTS cr
Credits	120 (min.)	ECTS cr

<i>Obligatory Studies (60 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH40A1301	Power Machines in Renewable Energy	M.Sc. (Tech.) 2	2	5
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

BH60A2101	Advanced Course in Life Cycle Assessment	M.Sc. (Tech.) 2	1-2	7
BH60A2200	Air Pollution Control	M.Sc. (Tech.) 1	3-4	3
BH60A2401	Energy Recovery from Solid Waste	M.Sc. (Tech.) 2	1-2	4
BH61A0600	Bioenergy	M.Sc. (Tech.) 1	1	3
BH10A1200	Master's Thesis and Seminar			30

Additional Information

Personal Study Plan

The personal study plan (PSP) is the student's own plan how s/he is going to complete the Master's degree. The degree structure of the Master's programme determines the frame of the studies. At the Master's level, the student makes the PSP by the end of 1st period, and submits it to International Study Coordinator for comments. The electronic personal study plan (ePSP, in Finnish eHOPS) is a tool for drawing the plan up. The students of the Faculty of Technology are recommended to complete the PSP in an electronic form by using the ePSP tool at WebOodi.

Credit Transfer

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 International Study Coordinator.

Complementary Studies

The student with a Finnish degree from the University of Applied Sciences or equivalent may have to study complementary studies. The extent of these studies depends on the content of the previous degree. More information is available from International Study Coordinator.

Traineeship

A traineeship in the Master's degree can be worth 6 ECTS credits. A two-week full traineeship is worth one ECTS credit. Employment prior to the studies at LUT can be accepted, if it has not been included in any previous degrees. The traineeship is approved by traineeship coordinators.

Maturity Test

The student must take a maturity test to show how well s/he knows the topic of the Master's thesis. The test evaluates the student's familiarity with the theories and problems of the thesis. The student is asked to contact the supervising professor to agree how the maturity test is taken, that is, as a seminar presentation or as a written test. The maturity test is evaluated on a scale of passed/failed by the supervising professor of the thesis.

Contact Information

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The Courses Offered in English

		<i>ECTS cr</i>
BH10A1100	Master's Thesis and Seminar	30
BH10A1200	Master's Thesis and Seminar	30
BL10A2000	Master's Thesis and Seminar	30
BH30A1400	Nuclear Engineering I	6
BH30A1500	Nuclear Engineering II	5
BH30A1600	Nuclear Reactor Physics	6
BH40A1301	Power Machines in Renewable Energy	5
BH40A1500	Turbulence Models	4
BH50A1200	Energy Systems Engineering	6
BH50A1300	Maintenance Management	4
BH50A1400	Steam Boilers	6
BH50A1500	Bioenergy Technology Solutions	6
BH50A1600	Waste Heat Recovery Techniques	6
BH60A1101	Environmental Technology Project Work	2 - 7
BH60A1600	Basic Course on Environmental Management and Economics	5
BH60A2000	Emission Trading	3
BH60A2101	Advanced Course in Life Cycle Assessment	7
BH60A2401	Energy Recovery from Solid Waste	4
BH61A0600	Bioenergy	3
BH70A0001	Numerical Methods in Heat Transfer	6
BH70A0200	Advanced Topics in Modelling of Energy Systems	6
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
BL30A1001	Electrical Drives	8
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

BH10A1100	MASTER'S THESIS AND SEMINAR	30 ECTS cr
	Diplomityö ja seminaari	
Year and Period	M.Sc. (Tech.) 2, Period 1-4	
Teacher(s)	professors of the degree programme Person in Charge: Professor, D.Sc. (Tech.) Esa Vakkilainen	
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 a 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 presentation of the thesis will be arranged with the supervising professor.	
Evaluation	There will be no separate seminar. 0-5, Master's thesis 100 %	
BH10A1200	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 Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	By the end of the course, the student is expected to be able to - define a research problem - choose and apply research methods relevant to the research problem - search for suitable reference material, and assess the quality and reliability of the material and the information it contains - use and interpret reference material correctly and diversely - report on his or her work in writing, taking into account language and layout requirements	
Content	- give a concise oral presentation on the content and results of the work The thesis is a research or a 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 presentation of the thesis will be arranged with the supervising professor. There will not be a separate seminar.	
Evaluation	Total workload approx. 780 h. 0-5, Master's thesis 100 %.	
BL10A2000	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.) Pertti Silventoinen	
Aims	Upon completion of the course the student will be able - delineate a research problem, - select research methodology suitable for the study, - find relevant reference material and assess the credibility of sources, - apply the material correctly to his/her own work and - write a scientific report according to scientific practices with a special reference to electrical engineering	
Content	Fundamentals of scientific work. Good scientific conduct associated with definition of a research problem, selection of research methodology, problem solving and scientific reporting with special focus on electrical engineering practices. Application of scientific knowledge to problem solving. Good information processing skills. Scientific reporting. Information search. Scientific	

46 Energy Technology

Modes of Study	writing skills. Writing the M.Sc. thesis. Writing the M.Sc. thesis. The seminar part of the course is completed by presenting the M.Sc. thesis to the examiner and/or to the commissioner of the thesis.
Evaluation	0-5, Master's thesis 100 %.
BH30A1400	NUCLEAR ENGINEERING I 6 ECTS cr
	Nuclear Engineering I The course will be lectured during the academic year 2012-2013
Year and Period	M.Sc. (Tech.) 1, Period 1-2
BH30A1500	NUCLEAR ENGINEERING II 5 ECTS cr
	Nuclear Engineering II The course will be lectured during the academic year 2012-2013.
Year and Period	M.Sc. (Tech.) 1, Period 3-4
BH30A1600	NUCLEAR REACTOR PHYSICS 6 ECTS cr
	Nuclear Reactor Physics The course will be lectured during the academic year 2012-2013.
Year and Period	M.Sc. (Tech.) 2, Period 2-3
BH40A1301	POWER MACHINES IN RENEWABLE ENERGY 5 ECTS cr
	Power Machines in Renewable Energy
Year and Period	M.Sc. (Tech.) 2, Period 2
Teacher(s)	Professor, D.Sc. (Tech.) Jari Backman and D.Sc. (Tech.) Aki-Pekka Grönman
Aims	Upon completion of the course the student will be able to - choose and calculate the main performance of wind turbines - explain, where reciprocative engines, gas turbines, steam turbines and organic rankine cycles can be used to utilize renewable energy. - understand, where fuel cells can be used.
Content	Gas turbines, micro turbines, wind turbines, fuel cells, reciprocative engines.
Modes of Study	Lecture and exercise events 16 hours. The students are expected to familiarize in advance with the Material Notebook and Blackboard, to make the expected exercises and quizzes.
Evaluation	0-5. The evaluation is based on the quizzes and final exam, which will be done in the Exam Aquarium. Approved (50%) performance in the quizzes and exercises may add extra points to the final exam assessment.
Study materials	Material Notebook, Blackboard course material: summary, exercises, quizzes
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.
BH40A1500	TURBULENCE MODELS 4 ECTS cr
	Turbulence Models
Year and Period	M.Sc. (Tech.) 2, Period 3-4
Teacher(s)	Docent, D.Sc. (Tech.) Teemu Turunen-Saaresti
Aims	Student is able to recognize different characteristics of the turbulence models and student is able to estimate how different turbulence models are suited to

Content	different fluid mechanical problems. In addition, student is able to interpret the physical basis and the theory of the turbulence models.
Modes of Study	Navier-Stokes equations, RANS equations, eddy viscosity, algebraic, one equation and two equation models, Reynolds stress model and Large Eddy Simulation.
Evaluation	Lectures 12 h and exercises 12 h, 3rd period. Lectures 12 h and exercises 12 h, 4th period. Examination.
Study materials	0-5, examination 50%, home works 50%.
Prerequisites	David C. Wilcox: Turbulence models for CFD. Noppa –portal (noppa.lut.fi)
Further Information	BH70A0001 Numerical Methods in Heat Transfer This course has 1-5 places for open university students. More information on the web site for open university instruction.

BH50A1200	ENERGY SYSTEMS ENGINEERING	6 ECTS cr
	Energy Systems Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	Upon completion of the course the student will be able to	
	<ul style="list-style-type: none"> - describe different types of energy production processes. - utilize thermodynamics and heat- and mass balances in design of small scale energy systems - use Systems Engineering- type approach to define design values for energy production processes - define small scale bioenergy production projects - understands how plant requirements affect the planning and implementation phases of small energy systems. - define economic constraints to small scale energy processes 	
Content	History and fundamentals of thermodynamics and energy engineering. Modern problems of power plant engineering, combined heat and power production especially from biomass. Fundamentals of steam and gas turbines in energy production. Systems engineering. Planning and implementation of energy systems. Economic optimization of energy system projects.	
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, examination 70%, written assignment 30%.	
Study materials	Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BH50A1300	MAINTENANCE MANAGEMENT	4 ECTS cr
	Maintenance Management	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Docent, D.Sc. (Tech.) Juha Kaikko	
Aims	Person in Charge: Professor, D.Sc. (Tech.) Esa Vakkilainen	
	Upon completion of the course the student will be able to	
	<ul style="list-style-type: none"> - identify terminology used in maintenance management - explain maintenance strategies - describe failure mechanisms - utilize the concepts of reliability and availability - describe how maintenance management is organized in power industry - know how to use maintenance information systems 	
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. Examination.	

48 Energy Technology

Evaluation	0-5, written assignment 30%, examination 70%
Study materials	Dhillon, B.S.: Engineering Maintenance: A Modern Approach, CRC Press, 2002. Blackboard.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BH50A1400	STEAM BOILERS	6 ECTS cr
	Steam Boilers	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	Upon completion of the course the student will be able to <ul style="list-style-type: none">- list typical biomass fuels and their properties- understand terminology used in maintenance management- understand steam generation processes especially from biomass- describe the construction of steam boilers- apply different types of steam boilers to need of using different types of fuels.- realizes restrictions based by corrosion, erosion and fouling	
Content	Characteristics of fuels especially biofuels. Combustion and gasification. Design of a steam boiler and its components. Energy balances. Solving steam boiler problems by 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. Demonstrations with modeling programs. Written assignment.	
Evaluation	0-5, written assignment 70%, work with programs 30%.	
Study materials	Lecture notes. Teir, Sebastian: Steam Boiler Technology, 2nd ed. 2006. Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BH50A1500	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	Upon completion of the course the student will be able to <ul style="list-style-type: none">- discuss the EU bioenergy policies including the effects of carbon trading; Res and energy efficiency- understands the role and limitations of bioenergy use in Europe- create a strategic vision for any country to use bioenergy- understands differen bioenergy generation technologies- list how biofuels are produced	
Content	Comparison of various bioenergy visions. 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. Assignment, seminar presentation. Written examination.	
Evaluation	Examination 60%, assignment 40%.	
Study materials	Energy Visions 2050 for Finland, VTT Energy, 2009. Additional material will be announced later during lectures. Blackboard.	
Prerequisites	BH80G0000 Bioenergy	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BH50A1600	WASTE HEAT RECOVERY TECHNIQUES	6 ECTS cr
	Waste Heat Recovery Techniques	
	Examination language can also be Finnish. Tenttiin voi vastata myös suomeksi	
Year and Period	M.Sc. (Tech.) 2, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Esa Vakkilainen	
Aims	Upon completion of the course the student will be able to <ul style="list-style-type: none"> - discuss the role of waste heat in different industries - dimension simple waste heat recovery equipment - conduct and manage an energy efficiency study - describe in detail different waste heat recovery techniques. 	
Content	Opportunities and drivers to recover waste heat. Dimensioning of waste heat recovery equipment. Economics of heat recovery units. Heat recovery in a heating and ventilation systems. Managing industrial energy efficiency programs. 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. Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BH60A1101	ENVIRONMENTAL TECHNOLOGY PROJECT WORK	2 - 7 ECTS cr
	Ympäristötekniikan erikoistyöt	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	By the end of the course, the student is expected to be able to <ul style="list-style-type: none"> - choose appropriate research methods for a research problem in a given field of environmental technology - find appropriate reference material for research - prepare a written report on his or her work according to instructions 	
Content	Producing a research report on a given subject on the basis of a literature review. The subject of the research can also be assigned by an enterprise.	
Modes of Study	Advanced practical or seminar work 50-180 h,(=independent work), 1st-4th periods. The method of completion is agreed on with the supervising professor. No contact teaching.	
Evaluation	0-5, project work 100%	
Prerequisites	The prerequisites are set individually depending on the case.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BH60A1600	BASIC COURSE ON ENVIRONMENTAL MANAGEMENT AND ECONOMICS	5 ECTS cr
	Basic Course on Environmental Management and Economics	
	Undergraduate students of Environmental Technology complete the course BH60A1500 Ympäristöjohtamisen ja talouden perusteet.	
Year and Period	B.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	By the end of the course, the student is expected to be able to	

	<ul style="list-style-type: none"> - describe the challenges that sustainable development poses to business and the methods that control those challenges - analyse what sustainable development means for business - identify corporate stakeholders and analyse their importance - use and compare the tools for measuring eco-efficiency - explain the basics of life cycle analysis - recognize basic environmental management tools and explain the reasons for their use - understand the basics of environmental labeling, environmental marketing and sustainability reporting. <p>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.</p>
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. Understanding the basics of environmental labeling, environmental marketing and sustainability reporting.
Modes of Study	Lectures 24 h, 1st and/or 2nd period Written assignment, approx. 56 h (reading the literature and writing the assignment, writing case reports) 1st and/or 2nd period Written examination and preparation for it, approx. 50 h. Total workload 130 h.
Evaluation	0-5, examination 70 %, written assignment 20 %, case-exercises 10 %
Study materials	Literature will be announced later.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BH60A2000	EMISSION TRADING	3 ECTS cr
	Emission Trading	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	By the end of the course, the student is expected to be able to	
	<ul style="list-style-type: none"> - explain the carbon markets mechanism - describe different emission trading schemes in and outside Europe - explain the impacts of an emission trading scheme on different stakeholders 	
Content	Topics include: Carbon Markets, the Kyoto protocol and Kyoto mechanisms, the EU emission trading scheme, the impact of emission trading on different industries.	
Modes of Study	Lectures 14 h, 3rd period. Assignment and seminars, 4th period. Independent study approx. 64 h. Total workload approx. 78 h.	
Evaluation	0-5, examination 75%, assignment 25 %	
Study materials	Arnaud Brohé, Nick Eyre and Nicholas Howarth : Carbon Markets An International Business Guide (2009).	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BH60A2101	ADVANCED COURSE IN LIFE CYCLE ASSESSMENT	7 ECTS cr
	Advanced Course in Life Cycle Assessment	
	Korvaa opintojakson BH60A2100 Elinkaarimallintaminen. Luennot kieli suomi/englanti. Starting in the academic year 2012-2013, the course	

	should be taken in the year M.Sc. (Tech.) 1, Periods 3-4.
Year and Period	M.Sc. (Tech.) 2, Period 1-2
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Risto Soukka
Aims	By the end of the course, the student is expected to be able to <ul style="list-style-type: none"> - explain the basic life cycle concepts - plan, implement and analyse assessments to select products and services which fulfil the requirements of sustainable development - plan, implement and analyse assessments to reveal development needs of products and services - implement the life cycle costing calculation of a product or service - recognise the most inexpensive ways to reduce the environmental impact - perform life cycle assessments using software
Content	Introduction to life cycle assessment, carrying out life cycle assessment, aspects related to inventory analysis, aspects related to impact assessment, calculating a carbon footprint, introduction to life cycle costing, aspect related to life cycle costing, LCA and LCC examples.
Modes of Study	Lectures 14 h. 1st period. Computer training 3 h, 1st period, and 4 h, 2nd period. Written assignment 1, approx. 38 h. 1st period. Written assignment 2, approx. 82 h. 2nd period. Written examination and preparation for it, approx. 41 h Total workload approx. 182 h (26 h*7 ECTS cr.)
Evaluation	0-5, written assignments 75%, examination 25%.
Study materials	Possible literature will be announced later. Blackboard.
Prerequisites	Understanding the basics of life cycle thinking. BH60A1500 Basic Course on Environmental Management, BH60A0250 Solid Waste Management.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BH60A2401	ENERGY RECOVERY FROM SOLID WASTE	4 ECTS cr
	Energy Recovery from Solid Waste	
	Replaces the course BH60A2400 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	By the end of the course, the student is expected to be able to <ul style="list-style-type: none"> - describe the properties of waste as fuel - explain the most common waste-to-energy technologies and their suitability for different energy recovery applications and materials - determine the waste-to-energy recovery potential of a region - describe the most important flue gas emissions and their reduction technologies characteristic for the combustion of waste - analyse the role of energy recovery in municipal waste management 	
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, anaerobic digestion of waste, landfill gas utilisation in energy production.	
Modes of Study	Lectures 18 h, exercises 14 h, practical assignment approx. 47 h, assignment info 2 h. Written examination and preparation for it, approx. 23 h. Total workload approx. 104 h.	
Evaluation	Exam 60 %, practical assignment 40 %.	
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.	

52 Energy Technology

Prerequisites	Basic knowledge on thermodynamics, chemistry and power plant technology.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BH61A0600	BIOENERGY	3 ECTS cr
	Bioenergy	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Tapio Ranta	
Aims	After the course student understands what are bioenergy, alternative biomass resources, supply methods, refining and end-user applications. Student knows the quality properties of solid biofuels and how they are measured and evaluated by using standards. Student can explain what means the sustainability in bioenergy systems.	
Content	The role of bioenergy in the EU energy policy, incentive programmes and future plans. Raw-material sources of bioenergy, potential resources and current use. Biomass supply systems and logistics. Refined biofuel commodities, biogas and liquid biofuels. Biomass international trade. Quality properties of solid biofuels, quality measurement and standards. Sustainable bioenergy.	
Modes of Study	Lectures 14 h. Written examination.	
Evaluation	Examination 100%.	
Study materials	Blackboard. Energy Visions 2050, VTT. 2009. Chapters 2, 4,4, 5.2-5.4. Additional material will be announced later during lectures.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BH70A0001	NUMERICAL METHODS IN HEAT TRANSFER	6 ECTS cr
	Numerical Methods in Heat Transfer	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Docent, D.Sc. (Tech.) Teemu Turunen-Saaresti Person in Charge: Professor, D.Sc. (Tech.) Timo Hyppänen	
Aims	This course acquaints students with the key numerical methods in heat and mass transfer and with the use of these methods. After completing this course, students will be able to solve the different kind of heat transfer and fluid dynamic problems using numerical methods. Students are also able to explain theory and limitations of studied numerical methods and they are able to form equations using the finite volume method. Students will be able to use numerical software for the computation of simple cases and interpret and analyze gained results.	
Content	Numerical solution methods for the conservation of mass, momentum and energy. Solutions for heat conduction and convection. The finite volume method. Formulation of discretised conservation equations. The solution of equation sets. Unsteady Stability analyses. Setting boundary conditions. The basics of fluid dynamics software: the grid generation, solution and post-processing of results.	
Modes of Study	Lectures 12 h, exercises 12 h, 1st period. Lectures 12 h, exercises 12 h, 2nd period. Homework 60 h. Oral examination.	
Evaluation	0-5, examination 100%.	
Study materials	Noppa –portaali (noppa.lut.fi) Patankar, Suhas V.: Numerical Heat Transfer and fluid flow. Versteeg, H.K.: An introduction to Computational Fluid Dynamics, The Finite Volume Method.	
Prerequisites	BH20A0450 Heat Transfer and BH40A0000 Fluid Dynamics.	

BH70A0200	ADVANCED TOPICS IN MODELLING OF ENERGY SYSTEMS	6 ECTS cr
	Advanced Topics in Modelling of Energy Systems	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Timo Hyppänen, Professor, D.Sc. (Tech.) Esa Vakkilainen, Docent, D.Sc. (Tech.) Teemu Turunen-Saaresti, Docent, D.Sc. (Tech.) Juha Kaikko, D.Sc. (Tech.) Jouni Ritvanen, D.Sc. (Tech.) Tero Tynjälä, Lic.Tech. Juhani Vihavainen	
Aims	Person in Charge: Professor, D.Sc. (Tech.) Timo Hyppänen Upon completion of the course the student will be able to - create stationary and time dependent mass, momentum and energy balances for various kinds of energy systems. - perform design tasks, to utilize mathematical software in calculation, and to analyze the characteristics of energy systems. - include material property definitions to mathematical software or to own code when simulating energy systems. - create, solve and analyze the set of stationary and time dependent balance equations using Excel and MATLAB. - create, solve and analyze stationary energy systems with IPSEpro software package - create, solve and analyze time dependent energy systems with APROS software package	
Content	To introduce advanced problems in modeling of energy systems needed by engineers and researchers. The course lectures provide mathematical basis for problem formulation, and exercises providing a chance to work with various computational packages.	
Modes of Study	Lectures 12 h and case exercises 12 h, 1st period. Lectures 12 h and case exercises 12 h, 2nd period. Work with modeling programs. Written assignments. Seminar work.	
Evaluation	0-5, written assignments 70%, seminar work 30%.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BL20A0201	POWER EXCHANGE GAME FOR ELECTRICITY MARKETS	3 ECTS cr
	Power Exchange Game for Electricity Markets	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Teacher(s)	Doctoral student, M.Sc. (Tech.) Mari Makkonen Person in Charge: Professor, D.Sc. (Tech.) Satu Viljainen	
Aims	Upon completion of the course the student will be able to - plan electricity purchase and sale in an economically viable way, - recognise the most common risk management instruments, - exploit financial products of the power exchange in risk management and - trade electricity on day ahead and intraday markets. These skills will be practised in a power exchange game, after which the student will be able to analyse and interpret the game results.	
Content	Electricity purchase/sale, OTC markets, physical products on the power exchange (spot and elbas), financial products on the power exchange (forwards, futures and options), risk management.	
Modes of Study	Lectures 8 h, weekly game situation practice 40 h, 2nd and 3rd period. Written homework, intermediate report and final report.	
Evaluation	0 - 5, written report 100%.	
Study materials	Material handed out in class.	
Prerequisites	BL20A0400 Electricity market	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BL20A0401	ELECTRICITY MARKET	5 ECTS cr
	Electricity Market	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Jarmo Partanen, Professor, D.Sc. (Tech.) Satu Viljainen	
Aims	Upon completion of the course the student will be able to <ul style="list-style-type: none"> - describe the characteristics of the different business sectors in the Nordic electricity market, - explain electricity price formation, - model electricity consumption, - explain the operation principle of the power exchange, - identify and describe the products of the power exchange, - select the right risk management method for electricity trade, - describe the tasks of the different parties in an electric power system in maintaining technical and commercial power balance, - conduct the balance settlement, - price the products of electricity trade and distribution and - describe why and how electricity distribution business is regulated. 	
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 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 distributed in class.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BL20A0501	ELECTRICITY DISTRIBUTION TECHNOLOGY	8 ECTS cr
	Electricity Distribution Technology	
	The course is part of the Master's Degree Programme in English. Teaching is conducted in Finnish and English.	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Jarmo Partanen, Postdoctoral Researcher, D.Sc. (Tech.) Jukka Lassila	
Aims	Upon completion of the course the student will be able to <ul style="list-style-type: none"> • perform technical and financial calculations related to electricity distribution networks: voltages, currents, losses, fault currents, reliability, investment, outage and maintenance costs, • compile long-term strategic development plans related to electricity distribution networks, • carry out techno-economic dimensioning of an electricity distribution network. • explain the targets and principles of the use of electricity distribution networks • utilise the distribution automation applications in the operation of a distribution network and • design short circuit and earth fault protection in electricity distribution networks. 	
Content	Network design; the use, protection and automation of distribution networks; information systems of distribution companies. 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, 1st and 2nd period. Written examination.	
Evaluation	0–5, examination 100 %.	
Study materials	Lakervi, E. & Partanen, J.: Sähköinjanelutekniikka (Otatieto, moniste 609).	
Prerequisites	BL20A0700 Introduction to Electrical Power Systems, BL20A0601 Electrical	

Further Information	Power Transmission and BL20A0401 Electricity Market attended. This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BL20A0601	ELECTRICAL POWER TRANSMISSION	5 ECTS cr
Year and Period	Electrical Power Transmission	
Teacher(s)	M.Sc. (Tech.) 1, Period 2 Person in Charge: Professor, D.Sc. (Tech.) Jarmo Partanen	
Aims	Upon completion of the course the student will be able to <ul style="list-style-type: none"> • describe the operation principle of an electric power system, • explain and determine the principles of frequency and voltage control in an electric power system, including the special features of the Nordel system, • calculate the power flow and fault currents in meshed power transmission systems, • calculate the static and transient stability of a single generator, • describe the basic techniques and application targets of DC transmission and • explain the implementation principles of fault protection in a meshed power transmission network. 	
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 BL30A0000 Electric Circuits and attended the lectures of BL20A0700 Introduction to Electrical Power Systems.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BL30A0400	DESIGN OF AN ELECTRICAL MACHINE	6 ECTS cr
	Design of an Electrical Machine	
	Suomenkielinen opetusmoniste sekä suomenkieliset harjoitustehtävät ovat saatavilla. Tenttiin saa vastata suomen kielellä. Tenttiin saa vastata suomen kielellä.	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Juha Pyrhönen	
Aims	Upon completion of the course the student will be able to <ul style="list-style-type: none"> - perform a basic design of a rotating electrical machine, - name the simplest winding arrangements and other components of the machine, - explain the torque production process in electrical machines, - calculate the main data (equivalent circuit parameters) of an electrical machine from machine geometric and winding designs, - list the most important materials used in magnetic circuits and windings, - model the machine with an equivalent circuit, - compare machine designs with each other by using the per unit presentation of machines, - use phasor diagrams in the machine analysis and - discuss the problems of insulation systems and heat transfer. 	
Content	Electromagnetic 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, 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.	

Modes of Study	28 h of lectures, 28 h of tutorials, 1st period. The design assignment of an electric machine. Written examination.
Evaluation	0–5, written examination 100 %. Satisfactorily completed assignment required.
Study materials	Pyrhönen, Jokinen, Hrabovcova: Design of Rotating Electrical Machines (Pyörivän sähkökoneen suunnittelu).
Prerequisites	Students are recommended to have completed BL30A0000 Electric Circuits, BL10A0100 Basics of Electric Engineering.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BL30A0600	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	Upon completion of the course the student will be able to <ul style="list-style-type: none"> - demonstrate good general knowledge of the different basic main circuits in modern power electronics, - describe the features and functions of different rectifiers, switch-mode converters and inverters, - calculate and simulate typical design tasks of the aforementioned circuits and - describe the joint operation of static converters and loads as well as the network interferences caused by converters and alternatives to reduce 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. 14 h of lectures, 14 h of tutorials, 2nd period. Written examination.	
Evaluation	0–5, examination 100 %.	
Study materials	Mohan, Undeland, Robbins: Power Electronics, converters, applications, and design, where applicable.	
Prerequisites	BL30A0000 Electric Circuits. Integration and derivation (esp. sine and cosine functions). FFT. Laplace transforms.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BL30A1001	ELECTRICAL DRIVES	8 ECTS cr
	Electrical Drives	
	The Course will be given in English. Suomenkielinen opetusmoniste sekä suomenkieliset harjoitustehtävät ovat saatavilla. Tenttiin saa vastata suomeksi.	
Year and Period	M.Sc. (Tech.) 2, Period 2-3	
Teacher(s)	Person in Charge: Professor, D.Sc. (Tech.) Juha Pyrhönen	
Aims	Upon completion of the course the student will be able to <ul style="list-style-type: none"> - describe the principles of scalar, vector and direct torque control of rotating field machines, - model the behaviour of different synchronous and asynchronous machines by using vector equivalent circuits and vector diagrams, - name the main ideas of the electromagnetic design and performance of different rotating machines, - select a suitable electrical machine for a certain purpose and evaluate their thermal limits in cyclic operation, - define the most important power electronic converters and their properties in 	

Content	different applications, - discuss the principles of PWM, space vector modulation and DTC and - discuss the adverse effects of PWM systems on motor behaviour and the wave nature of the motor cable. Theory of electric motor drives, operation and vector equivalent circuits. Synchronous machine drives, asynchronous machine drives, synchronous reluctance machine drives, permanent magnet synchronous machine drives, switched reluctance motor drives. Torque production in different machines. Power electronic converters suitable for motor and generator drives. Scalar control, vector control, direct flux linkage control and direct torque control (DTC). Motor cable wave nature, bearing currents. Suitable also for post graduate studies.
Modes of Study	Lectures and seminars 28 h, tutorials 20 h, 2nd period. Lectures and seminars 28 h, tutorials 20 h, 3rd period.
Evaluation	0–5, written examination 100 %.
Study materials	Pyrhönen, Juha: Electrical Drives, lecture material.
Prerequisites	The students are recommended to have completed the courses BL30A0000 Electric Circuits, BL10A0100 Basics of Electric Engineering, BL30A0200 Laboratory Course in Electrical Engineering, BL30A0500 Introduction to Electrical Drives and BL30A0800 Electromagnetic Components and to have attended the courses BL30A0400 Design of an Electrical Machine and BL30A0900 Power Electronic Components.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BL30A1200	NUMERICAL METHODS IN ELECTROMAGNETISM	4 ECTS cr
	Numerical Methods in Electromagnetism	
Year and Period	M.Sc. (Tech.) 2, Period 3	
Teacher(s)	Assistant professor, D.Sc. (Tech.) Janne Nerg	
Aims	Upon completion of the course the student will be able to - model and analyse electrical machines using commercial finite element based calculation software.	
Content	The fundamentals of the element method, boundary conditions, modelling of materials, 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	BL30A0500 Introduction to Electrical Drives and BL30A0400 Design of an Electrical Machine.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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)	Senior Lecturer, D.Sc. (Tech.) Antti Kosonen	
Aims	Upon completion of the course the student will be able to - utilise the services of a real-time operating system, - design the architecture of an application program using a real-time operating system as its basis and - implement a simple real-time operating system using the C language.	

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, assignment, 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	BL40A1100 Embedded System Programming.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BL40A1100	EMBEDDED SYSTEM PROGRAMMING	4 ECTS cr
	Embedded System Programming	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Assistant professor, D.Sc. (Tech.) Tuomo Lindh	
Aims	Upon completion of the course the student will be able to - apply C language and its structures to embedded system programming, - form complex data types such as structures, unions and buffers and use these in order to maintain information of different entities (e.g. processing units), - control the registers of a micro controller using C-language and - use different PUs of a micro controller.	
Content	Design tools, C-language in embedded system programming, 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.	
Modes of Study	14 h of lectures, 14 h of tutorials, 1st period. 14 h of lectures, 14 h of tutorials, 2nd period. Assignment. Written examination.	
Evaluation	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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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	Upon completion of the course the student will be able to - design digital state-space controllers (pole placement, optimal control) and transfer function controllers, - compare and discriminate between different discretisation techniques and different control design methods, - relate knowledge from the areas such as system modelling, model discretisation, designing digital control in a discrete time domain, computer simulation, and digital implementation - describe and explain the exemplary control systems and interpret system responses - apply the selected control design methods and system modelling concepts to new control problems that involve electromechanical systems.	
Content	State feedback, state estimator, design of a state-space controller, polynomial	

Modes of Study	control design, optimal control, disturbance estimation. Fundamentals of a multivariable control system. Simulation of a digital control system with Simulink. Programming of digital control for a microprocessor. Control design examples including control of real MIMO industrial systems. Utilisation of MATLAB in control design. 14 h of lectures, 14 h of tutorials, 1st period.
Evaluation	6–10 h of demonstration lectures and laboratory demonstrations, 14 h of tutorials in computer class, 2nd period. Assignment. Written examination.
Prerequisites	0–5, examination 100 %. Satisfactorily completed assignment required. BL40A0200 Control Systems Introduction and BL40A0501 Digital Control, Introduction.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

BL40A1810	MICROPROCESSORS A	6 ECTS cr
Year and Period	Mikroprosessorit A	
Teacher(s)	B.Sc. (Tech.) 3, Period 3-4 Professor, D.Sc. (Tech.) Jero Ahola	
Aims	The course is an introductory to embedded systems. Upon completion of the course the student will be able to - identify different microprocessor types and peripheral components, - describe the operation principles of microprocessor and its' peripheral components - program and test applications to embedded microcontroller by using both assembly and C languages.	
Content	Architecture of microprocessor, instruction set and operation, microcontrollers, memories, peripherals, embedded system design, programming and development of applications, embedded system design examples.	
Modes of Study	Lectures 14 h, exercises, 14 h, 3rd period. Lectures 14 h, exercises, 14 h, 4th period, assignment, examination.	
Evaluation	0–5, examination 100 %. Satisfactorily completed assignment required.	
Study materials	Vahid/Givargis: Embedded System Design - A Unified Hardware/Software Introduction. Lecture material.	
Prerequisites	Basics of digital design, basics of electronics, basics of programming.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

BL40A2201	PROCESS AND PRODUCT INNOVATIONS	10 ECTS cr
Year and Period	Process and Product Innovations	
Teacher(s)	Intended 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.	
Aims	M.Sc. (Tech.) 1-2, Period 1-4 Professor, D.Sc. (Tech.) Olli Pyrhönen, Professor, D.Sc. (Tech.) Tuomo Kässi, Associate Professor, D.Sc. (Tech.) Kimmo Kerkkänen, Associate Professor, D.Sc. (Tech.) Ville Ojanen Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen Upon completion of the course the student will be able to - recognise and describe the generation of innovations and new technology, typical methods, problems and their solutions, - work in projects and teams in interdisciplinary, international environments, - describe and explain product and process development and - apply and deepen many skills learned in other connections.	
Content	Methods of product and process development. Interdisciplinary R & D activities	

60 Energy Technology

Modes of Study	as project and teamwork. Development of new technology, patenting. Suitable also for postgraduate studies. Informational lectures, 6 h/period. Project meetings, 6 h/period. Independent project and team work in groups of 4–8 students.
Evaluation	0–5, project work 100 %.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

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	Upon completion of the course the student will be able to - describe the coupling mechanisms of electromagnetic interferences in power electronics, - name the most significant sources of electromagnetic emissions in power electronic systems, - recognise and be aware of cable reflection in electrical drives and - list the suitable filter types for common mode filtering, du/dt filtering and harmonics filtering.	
Content	The course can also be included in post-graduate studies. 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. An assignment to be completed as pair work. Written examination.	
Evaluation	0–5, written examination 100 %. Satisfactorily completed assignment required.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

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, Professor, D.Sc. (Tech.) Jero Ahola	
Aims	The student prepares a seminar presentation on a new topic in electronics. Upon completion of the course the student will be able to - demonstrate in-depth knowledge of a new topic in electronics.	
Content	The course is suitable also for postgraduate studies. 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 %.	
Study materials	The material will be specified in the introductory lecture.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

4.3. Master's Degree Programme in Mechanical Engineering

In the Master's degree programme in Mechanical Engineering there is a possibility to select between two majors, major in Design and Manufacturing or major in Packaging Technology. The major in "Manufacturing and Design" corresponds to 120 ECTS credits and 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 major in "Packaging Technology" 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. Both majors in the programme leads to the degree of Master of Science in Technology.

The Aims of the Master's Degree Programme

The objective in both majors is to educate experts in their own areas. In the "Design and Manufacturing" major particular emphasis is placed on future product design and production technologies. The aim is 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.

In the "Packaging Technology" major the emphasis is on packaging materials, converting and packaging technologies and the skills to work throughout the whole packaging chain. This 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 programme provides the foundation for both constructive design as well as production-oriented tasks and a variety of tasks in the packaging field. The professional tasks may include, for example, product development and design, management of design and production projects, technical sales both in domestic and international business. 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 Design and Manufacturing (min 60 ECTS cr):

The person responsible for the major in Design and Manufacturing is professor, D.Sc. (Tech.) Aki Mikkola

62 Mechanical Engineering

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 Design and Manufacturing 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).

Major Subject Packaging Technology (min 60 ECTS cr):

The person responsible for the major in Packaging Technology is professor, Ph.D Henry Lindell

In the mechanical engineering programme, students focus on machine design and manufacturing aspects. In the packaging technology the viewpoint is the packaging machine. Students learn about packaging materials, the converting of packaging materials into packages and the interaction of the package and the content. The design part is focused both on the design of packages and machine constructions needed to convert the packaging material into packages. The legislation influencing the packaging value chain is considered as well as the environmental impact of the various packaging materials and production methods.

The person responsible for major in Packaging Technology is professor Henry Lindell (Packaging technology). Other professors for major studies in the programme are professor professor Juha Varis (Production technology) and visiting professor Jurkka Kuusipalo (Converting technology).

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 B.Sc. (Econ. & Bus. Adm.) 2-3	1, 2, 3, 4	4
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3 M.Sc. (Tech.) 1-2 B.Sc. (Econ. & Bus. Adm.) 3	1-2, 3, 4, 5	4
FV18A9101 ^c Finnish 1	M.Sc. (Econ. & Bus. Adm.) 1-2	1, 3	2

^c Foreign students are required to study at least one course of Finnish language

Major in Design and Manufacturing

<i>Min. 30 ECTS cr (+ Master's Thesis and Seminar 30 ECTS cr) should be selected.</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
BK30A0600 Laser Based Products and Production Technology	M.Sc. (Tech.) 1	3-4	5
BK30A0700 Laser Materials Processing	M.Sc. (Tech.) 2	1-2	5
BK30A0800 Laboratory Course of Laser Materials Processing	M.Sc. (Tech.) 1	1-2	4
BK50A0700 Advanced Production Engineering	M.Sc. (Tech.) 1	1-2	7
BK50A2200 Design Methodologies and Applications of Machine Element Design	M.Sc. (Tech.) 1	3-4	5
BK60A0301 Servo Control Engineering	M.Sc. (Tech.) 1	1-2	8
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 ^c	Master's Thesis and Seminar	30
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^cObligatory for all

Major in Packaging Technology

<i>Min. 30 ECTS cr (+ Master's Thesis and Seminar 30 ECTS cr) should be selected.</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BK10A0100	Individual Project Work	M.Sc. (Tech.) 1	1-4	6
BK20A1300	Packaging Materials	M.Sc. (Tech.) 1	1-2	4
BK20A1400	Coating and Lamination of Fibre Based Packaging Materials	M.Sc. (Tech.) 1	1-3	5
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
BK50A2000	Legislation on Packaging, Interaction of Package and the Content, Environmental Issues and Sustainability	M.Sc. (Tech.) 1	3-4	5
BK50A2100	Printing and Package Design	M.Sc. (Tech.) 2	1-2	6
BK50A2200	Design Methodologies and Applications of Machine Element Design	M.Sc. (Tech.) 1	3-4	5
Thesis ^c	Master's Thesis and Seminar			30

^cObligatory for all

Minor in Packaging Technology

<i>Obligatory Studies (22 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
BK20A1300	Packaging Materials	1-2	4
BK20A1500	Principles of Chemistry, Paper Technology and Food Technology	1-4	5
BK50A1401	Packaging Lines and Machinery	3-4	7
BK50A2100	Printing and Package Design	1-2	6

Minor in Manufacturing

<i>Obligatory Studies (21 op)</i>		<i>per.</i>	<i>op</i>
BK20A0100	Materials Science	1-2	6
BK20A2200	Basics of Welding Technology	2	3
BK30A0600	Laser Based Products and Production Technology	3-4	5
BK50A0700	Advanced Production Engineering	1-2	7

Minor in Design

<i>Obligatory Studies (24 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
BK50A2200	Design Methodologies and Applications of Machine Element Design	3-4	5
BK60A0301	Servo Control Engineering	1-2	8
BK70A0000	Simulation of a Mechatronic Machine	3-4	6
BK80A1200	FE-analysis course	3-4	5

Minor Subject (min. 20 ECTS cr):

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

Elective Studies (min. 31-33 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 traineeship improving expertise.

Master 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.

Additional Information

Personal Study Plans

The personal study plan (PSP) is the student's own plan how s/he is going to complete the Master's degree. The degree structure of the Master's programme determines the frame of the studies. At the Master's level, the student makes the PSP by the end of 1st period, and submits it to International Study Coordinator for comments. The electronic personal study plan (ePSP, in Finnish eHOPS) is a tool for drawing the plan up. The students of the Faculty of Technology are recommended to compile the PSP in an electronic form by using the ePSP tool at WebOodi.

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 International Study Coordinator.

Complementary Studies

The student with a Finnish degree from the University of Applied Sciences or equivalent may have to study complementary studies. The extent of these studies depends on the content of the previous degree. More information is available from International Study Coordinator.

Traineeship

A traineeship in the Master's degree can be worth 6 ECTS credits. A two-week full traineeship is worth one ECTS credit. The traineeship is approved by traineeship coordinator.

Maturity Test

The student must take a maturity test to show how well s/he knows the topic of the Master's thesis. The test evaluates the student's familiarity with the theories and problems of the thesis. The student is asked to contact the supervising professor to agree how the maturity test is taken, that is, as a seminar presentation or as a written test. The maturity test is evaluated on a scale of passed/failed by the supervising professor of the thesis.

Further Information

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International Study Coordinator, Faculty of Technology:
Ms. Minna Loikkanen
Phone +358 40 824 1096, minna.loikkanen(at)lut.fi

The Courses Offered in English

		<i>ECTS cr</i>
BK10A0100	Individual Project Work	6
BK10A0300	Introduction to M.Sc. Studies	1
BK10A0900	Master's Thesis and Seminar	30
BK10A1100	Laboratory Work Course in Mechanical Engineering	10 - 30
BK20A0100	Materials Science	6
BK20A0400	Modern Welding Technology	7
BK20A1300	Packaging Materials	4
BK20A1400	Coating and Lamination of Fibre Based Packaging Materials	5
BK20A1500	Principles of Chemistry, Paper Technology and Food Technology	5
BK20A2200	Basics of Welding Technology	3
BK30A0600	Laser Based Products and Production Technology	5
BK30A0700	Laser Materials Processing	5
BK30A0800	Laboratory Course of Laser Materials Processing	4
BK50A0700	Advanced Production Engineering	7
BK50A1300	Converting and Forming of Fibre Based Packaging	5
BK50A1401	Packaging Lines and Machinery	7
BK50A2000	Legislation on Packaging, Interaction of Package and the Content, Environmental Issues and Sustainability	5
BK50A2100	Printing and Package Design	6
BK50A2200	Design Methodologies and Applications of Machine Element Design	5
BK60A0301	Servo Control Engineering	8
BK60A0601	Process and Product Innovations	10
BK70A0000	Simulation of a Mechatronic Machine	6
BK80A1200	FE-analysis course	5
BK80A1401	Fatigue Design	6

BK10A0100	INDIVIDUAL PROJECT WORK	6 ECTS cr
	Individual Project Work	
	Only for the students of Master's Degree Programme in Mechanical Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professors of the Degree Programme of Mechanical Engineering	
Aims	The aim of this course module is to prepare the student for a scientific approach in the M.Sc. thesis work. After having passed this course module the student is able to apply scientific research methods and carry out a research work.	
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. 146 h of tutorials and independent projects, 1st-4th period. Total workload 156 h.	
Evaluation	Pass/Fail, based on written report and oral presentation.	
Prerequisites	Consent of supervising professor.	
BK10A0300	INTRODUCTION TO M.SC. STUDIES	1 ECTS cr
	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 Person in Charge: Study Coordinator, M.A. Minna Loikkanen	
Aims	As an introductory course at Master's level, the course provides the student with basic knowledge of studying at LUT in general and particularly at his/her faculty and degree programme. The course helps the student to plan his/her studies at LUT and follow the progress of his studies with a help of the personal study plan.	
Content	The student learns to use the Blackboard learning base which is widely used at LUT. The key topic of the web course is to learn about information searching and the information sources available at LUT. After completing the course, the student knows how to search the Library online catalog Wilma and how to find printed and electronic material from the library collections and databases. The Orientation Days activities. Degree requirements. Planning of Master's studies. Making of the personal study plan. Use of the Blackboard learning base. LUT library collections and databases.	
Modes of Study	Participation in Orientation Days activities, Orientation Days. Library tour 1 h, 1st period. Assignments of information searching, library use and databases on Blackboard, 1st period. Personal study plan, 1st period. Independent study 25 h. Total workload 26 h.	
Evaluation	Pass/Fail	
Study materials	The Orientation Days, Study Guide, Blackboard, LUT library collections and databases.	
BK10A0900	MASTER'S THESIS AND SEMINAR	30 ECTS cr
	Diplomityö ja seminaari	

Year and Period	M.Sc. (Tech.) 2, Period 1-4
Teacher(s)	Professors and researcher/teachers of the major subject Person in Charge: University Lecturer, Lic.Sc. (Tech.) Inga Sihvo
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. Student is able to combine theory and practice: he/she can exploit theory in solving problems in scientific research. The student is capable of independent and target-oriented working, can set goals for him/her self concerning results and time schedules. The student manages extensive and versatile data acquisition knowhow.
Content	The Master's thesis is a research project by nature, which requires approximately 6 months of work. It is related to the student's major subject and its topic is agreed on by the supervisor and the student together. During the work, student must show capability to work independently according to defined plans and goals. Course includes seminars.
Modes of Study	The Master's thesis is a written report on the research work involved, presenting the stages of the work, the methods, results and explanations. Thesis includes a seminar, where are present students who are starting to write the Master's thesis and students who are about to graduate, and their supervisors. In the final stages, each student in his/her turn represents briefly their works goals, content and results. Student must participate other seminars before starting his/her own thesis, and also have his/her own at the end of the work.
Evaluation	0-5, Master's thesis 100%. Seminars passed.
Study materials	LUT Master's thesis instructions. Seminar instructions on the wweb pages of LUT Metal technology.

BK10A1100	LABORATORY WORK COURSE IN MECHANICAL ENGINEERING	10 - 30 ECTS cr
	Laboratory Work Course in Mechanical Engineering	
	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 mechanical engineering 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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BK20A0100	MATERIALS SCIENCE	6 ECTS cr
	Materials Science	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	University Lecturer, Lic.Sc. (Tech.) Raimo Suoranta Doctoral Student, M.Sc. (Tech.) Paul Kah	
Aims	After having passed this course module the student is able to: - utilize the basics of physical metallurgy and is able to explain the relationship between physical metallurgy and material properties - select proper material according to functionality and economics.	
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. LCC. Systems for selecting materials.	
Modes of Study	Lectures 24 h, 1st-2nd period. Independent study 132 h, 1st-2nd period. Total workload 156 h.	
Evaluation	0-5, examination 80%, tutorials 20%.	
Study materials	Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BK20A0400	MODERN WELDING TECHNOLOGY	7 ECTS cr
	Modern Welding Technology	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	University Lecturer, Lic.Sc. (Tech.) Raimo Suoranta M.Sc. (Tech.) Paul Kah	
Aims	After having passed this course module the student is able to: - identify and define the special features welding in production and product design - select proper processes and welding procedures for different materials.	
Content	Productivity, economy and quality in welding. Welding costs. Productive and efficient new welding processes. Weldability of the most common materials. Mechanization and robotization of welding. Basics of design of welded structures. Beveling methods. The quality, environmental and safety in welding workshop.	
Modes of Study	Lectures 28 h, 1st-2nd period. Tutorials 14 h, seminar, 1st-2nd period. Independent study 140 h. Total workload 182 h.	
Evaluation	0-5, examination 80%, seminar 20%.	
Study materials	Lecture notes. Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
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	After having passed this course module the student is able to: - compare the packaging related properties of various packaging materials - choose appropriate packaging materials for typical packaging applications.	
Content	The manufacture, physical and chemical properties (relevant for packaging) of the major packaging materials: paper, paperboard, corrugated board, wood,	

Modes of Study	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. Lectures total 16 h, 1st-2nd period. Exercises total 8 h, 1st-2nd period. Independent study 80 h. Total workload 104 h.
Evaluation	0-5, examination 70%, exercises 30%.
Study materials	Course material. Handouts. Blackboard.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.

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	After having passed this course module the student is able to: - compare various ways to combine materials with paper and board and - compare and evaluate their properties in different 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. Seminars 24 h, 1st-3rd period. Independent study 80 h. Total workload 130 h.
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. Blackboard.

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 and minor subject in Packaging Technology. Course registrations during 1st period. Course registrations during 1st period.
Year and Period	M.Sc. (Tech.) 1, Period 1-4
Teacher(s)	Professor, Ph.D. Henry Lindell
Aims	After having passed this course module the student is able to: - explain basic general, organic and biochemical phenomena - explain and categorize basics of paper technology and products - define packaging related features of processed food.
Content	Basic phenomena of general, organic and biochemistry.

70 Mechanical Engineering

Modes of Study	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. Essays with specific instruction. Independent study 130 h. Total work load 130 h.
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. Blackboard.

BK20A2200	BASICS OF WELDING TECHNOLOGY	3 ECTS cr
	Basics of Welding Technology	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	University Lecturer, Lic.Sc. (Tech.) Raimo Suoranta	
Aims	After having passed this course module the student is able to: - identify and define the special features of quality management in production of welded constructions and - evaluate the influence of welding to material properties.	
Content	Productivity, economy and quality in welding. Welding costs. Weldability of the most common materials. Basics of mechanization and robotization of welding. Basics of design of welded structures. Quality management.	
Modes of Study	Lectures 14 h, 2nd period. Independent study 64 h. Total workload 78 h.	
Evaluation	0-5, examination 100%.	
Study materials	Lecture notes.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BK30A0600	LASER BASED PRODUCTS AND PRODUCTION TECHNOLOGY	5 ECTS cr
	Laser Based Products and Production Technology	
	Replaces the course BK30A0500 Laser Processing.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Research Assistant, Lic.Sc. (Tech.) Heidi Piili M.Sc. (Tech.) Tuomas Purtonen Person in Charge: Professor, D.Sc. (Tech.) Antti Salminen	
Aims	After having passed the course module the student: - is able compare and generalize the special features of laser processing systems in production and the impact and utilization of special features of these processes on product design - knows how to select and develop proper process and processing procedure for processing of different materials - is able to utilize means of process monitoring to practice.	

Content	Knowledge on different laser equipment, accessories and processing systems and requirements of different ways to process material with laser beam. The principles of systems used for production. Tools of beam forming, guiding and modification. Knowledge on performance of most common laser processes like laser welding, cutting, marking, micro processing, additive manufacturing and surface treatment. Optical components used with laser processing, safety and quality assurance. Practical cases. Principles of utilization of laser based processes in product design. Economical aspects of laser materials processing. Utilization of the potential of laser processing possibilities on the product design. Special features of laser processing methods for product design.
Modes of Study	Lectures 28 h, 3rd-4th period. Seminar and tutorials 14 h, 3rd-4th period. Independent study 88 h. Total workload 130 h.
Evaluation	0-5, written exam 80%, seminar 20%.
Study materials	Steen W., Laser Material Processing. Blackboard.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BK30A0700	LASER MATERIALS PROCESSING	5 ECTS cr
	Laser Materials Processing	
	Replaces the course BK30A0300 Lasertekniikan jatkokurssi.	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Tech.) Veli Kujanpää Research Assistant, Lic.Sc. (Tech.) Heidi Piili M.Sc. (Tech.) Tuomas Purtonen Person in Charge: Professor, D.Sc. (Tech.) Antti Salminen	
Aims	After having passed the course module the student: - is able to compare and select the special features of laser materials processing processes - knows how to select and optimize proper process and processing procedure for different materials - is able to develop processes for different applications.	
Content	Laser beam material interaction, transmission, reflection, absorption. The features of different materials and laser beams on phenomena. Heating, melting, vaporizing, ablating material with laser beam. Behaviour of molten material, heat transfer mechanisms. Formation of keyhole and phenomena connected. Knowledge on existing ways to process material with laser beam and the effect of laser beam material interaction on that. Knowledge on most common laser processes like laser welding, cutting, marking, drilling, scribing, micro processing additive manufacturing and surface treatment. Practical cases, applications will be combined to theory.	
Modes of Study	Lectures 28 h, 1st-2nd period. Tutorials 14 h, 1st-2nd period. Independent study 88 h. Total workload 130 h.	
Evaluation	0-5, written exam 80%, seminar 20%.	
Study materials	Steen W., Laser Material Processing. Ion, J., Laser Processing of Engineering Materials. Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BK30A0800	LABORATORY COURSE OF LASER MATERIALS PROCESSING	4 ECTS cr
	Laboratory Course of Laser Materials Processing	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	M.Sc. (Tech.) Tuomas Purtonen Person in Charge: Research Assistant, Lic.Sc. (Tech.) Heidi Piili	
Aims	After having passed the course module the student is able to: - describe, specify and compare the special features and practical aspects of laser materials processing practices of different materials and - classify them for different processes.	
Content	Basics of laser processes, systems and equipment. Processability of common engineering materials with different processes. Principles of maintenance of laser processing system.	
Modes of Study	Lectures 10 h, 1st period. Laboratory practices 14 h, 1st-2nd period. Independent study 80 h. Total work load 104 h.	
Evaluation	0-5, written exam 50%, reports of laboratory practices 50%.	
Study materials	Lecture notes.	
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 University Lecturer, Lic.Sc. (Tech.) Inga Sihvo	
Aims	After having passed this course module the student is able to: - compare and evaluate 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 especially in the manufacturing of solid parts and sheet metal products - justify the role of manufacturing as a part of the company's strategy - handle duties in factory management and development as well as in research in the field.	
Content	The manufacturing methods for modern metal cutting, sheet metal production and basics of paperboard forming. 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). 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 20 h, 1st-2nd period. Literature work/home assignments 60 h, 1st-2nd period. Self study material, exercises and exam. Instructions will be given at start-up lecture. Visit to the Laboratory of Production Engineering during the start-up lecture. Independent study 102 h. Total workload 182 h.	
Evaluation	0-5, examination 100%, exercises pass/fail (in order to pass the course exercises must be accepted).	
Study materials	Materials to be announced during the start-up lecture.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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	
Aims	After having passed this course module the student is able to: - choose and evaluate various paper and board converting technologies and - compare and analyze 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 28 h. Independent study 102 h. Total workload 130 h.	
Evaluation	Written examination 100%.	
Study materials	Lecture handouts. Blackboard.	
BK50A1401	PACKAGING LINES AND MACHINERY	7 ECTS cr
	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 Associate Professor, D.Sc. (Tech.) Kimmo Kerkkänen Researcher, D. Sc. (Tech.) Huapeng Wu Visiting lecturer, M.Sc. (Tech.) Tapani Sarin	
Aims	After having passed this course module the student is able to: - explain and categorize operations and functions of packaging lines and - construct and derive 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. Team work and seminars 30 h. Independent study 132 h. Total workload 182 h.	
Evaluation	0-5, seminar 100%.	
Study materials	Handouts provided on Blackboard.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

BK50A2000	LEGISLATION ON PACKAGING, INTERACTION 5 ECTS cr OF PACKAGE AND THE CONTENT, ENVIRONMENTAL ISSUES AND SUSTAINABILITY	
	Legislation on Packaging, Interaction of Package and the Content, Environmental Issues and Sustainability	
	Replaces the course BK20A1201 Interaction of the Package and the Content, Passive and Active Packaging (4 ECTS cr) and BK50A1701 Food Packaging Hygiene, Legislation on Packaging, Sustainability and Environmental Issues Related to Packaging (4 ECTS cr).	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Professor, Ph.D. Henry Lindell Visiting lecturer, M. Sc. (Tech.) Päivi Harju-Eloranta Person in Charge: Professor, Ph.D. Henry Lindell	
Aims	After having passed this course module the student is able to: - describe and explain the EU-legislation on packaging - summarize the interaction of the package and the content and the relation to the regulation - recognize and formulate legislation aspects on the environmental and sustainability issues related to packaging.	
Content	The main content on EU legislation on food contact material and environmental issues. Legislation on active packaging. Fundamentals of the interaction of packaging and the content. The main analyzing methods of packages and packaging materials. Environmental issues of packaging and packaging waste. The environmental standardization of packages in EU. Sustainability concerning packaging legislation on product safety aspects and traceability.	
Modes of Study	Lectures total 24 h, 3rd-4th period. Exercises/seminars 16 h. Independent study 90 h. Total workload 130 h.	
Evaluation	0-5, examination 50%, seminar work 50%.	
Study materials	Handouts.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	
BK50A2100	PRINTING AND PACKAGE DESIGN	6 ECTS cr
	Printing and Package Design	
	The course will be lectured first time during the academic year 2011-2012.	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Professor, Ph.D. Henry Lindell M.Sc. (Tech.), B.Sc. (Arts) Noora Nylander Visiting lecturer, M.Sc. (Tech.) Risto Vesanto Industry lecturers Person in Charge: Professor, Ph.D. Henry Lindell	
Aims	After having passed this course module the student is able to: - compare and analyze different printing methods used in packaging industry - choose proper printing methods for a certain packaging solution - solve printing problems and to control print quality - justify the importance of graphic design process in packaging - communicate with the various partners involved in a design process - to act as a producer for a dedicated product.	
Content	Pre-press operations. The main printing technologies and their use in packaging industry. Printing of various substrates. Composition of printing inks.	

Modes of Study	Emerging printing technologies and their potential use in packaging industry. Future trends of printing technologies. Aspects of the role of package in the value chain. Demands set on the lay-out of a package. Various ways for idea generation of a package lay-out. Lectures total 20 h, 1st-2nd period. Exercises/seminars 30 h. Independent study 106 h. Total work load 156 h.
Evaluation	0-5, examination 50%, seminarwork 50%.
Study materials	Handouts. Saarelma, H., Oittinen, P., Printing. In series of books: Papermaking Science and Technology, Book 13, Fapet, Helsinki 1989.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.

BK50A2200	DESIGN METHODOLOGIES AND APPLICATIONS OF MACHINE ELEMENT DESIGN	5 ECTS cr
	Design Methodologies and Applications of Machine Element Design	
	Replaces the course BK50A1201 Machine Design for Packaging Technology.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Harri Eskelinen	
Aims	After having passed the course student knows: - how to dimension the most essential machine elements according to the requirements of their strength, reliability, lifetime and wear - how to carry out mechanisms synthesis and analysis for typical engineering applications - how to handle the design process of a simple machine or mechanism and means to estimate functional aspects of applied technology.	
Content	Basic mechanisms types, mechanisms analysis and synthesis, reliability-based machine design, wear phenomena and lifetime analysis of selected machine parts and elements. Different methodologies of DFM(A) and means to apply them in mechanical engineering. Knowledge about how to design a simple machine or mechanisms for special application areas of mechanical engineering and means to estimate functional aspects of applied technology.	
Modes of Study	Lectures total 28 h, 3rd-4th period. Exercises total 28 h, 3rd-4th period. Seminar 16 h, 3rd-4th period. Independent study 58 h. Total workload 130 h.	
Evaluation	0-5, examination 50%, exercises and seminar 50%.	
Study materials	Erdman A.G., Mechanism Design. Norton R.L., Design of Machinery.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

BK60A0301	SERVO CONTROL ENGINEERING	8 ECTS cr
	Servo Control Engineering	
	Replaces the course BK60A0300 Servo Control Engineering.	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Associate Professor, D.Sc. (Tech.) Huapeng Wu	
Aims	The aim of this course is to develop the theoretical and practical expertise in the analysis and design of control systems as well as modeling and simulation	

	<p>of such systems. The application of control system strategies covers a wide area and the course provides a sound base for the study of both classical and modern techniques. After having passed this course module, the student is able to:</p> <ul style="list-style-type: none"> - model and simulate the servo control systems - design servo control systems for hydraulic, pneumatic and electrical servo systems, e.g., by utilizing the frequency- and time-domain methods - construct both basic controllers and intelligent control systems, e.g., based on neural networks and fuzzy logic - utilize Matlab- and Simulink-software for simulation and design of servo control systems.
Content	<p>This course introduces common industrial servo control systems: hydraulic, pneumatic, and electro-mechanic systems. The dynamic analysis of these servo systems is studied in both time- and frequency-domain. Different control strategies are introduced, mainly classical with some concepts of modern control. Design and analysis of digital control will be introduced. During this course, the design, analysis, and simulation using Matlab and Simulink are conducted. Suitable also for postgraduate studies.</p>
Modes of Study	<p>42 h of lectures, 1st-2nd period. 42 h of tutorials, 1st-2nd period. 30 h of exercises, 2nd period. 20 h laboratory work. 24 h team work. 50 h independent study. Total loading 208 h.</p>
Evaluation	<p>0-5, examination 100%.</p>
Study materials	<p>Lecture notes. Selected chapters from the following text books: 1) Shinnars: "Modern control system theory and application". 2) Gene F. Franklin, J. David Prowell: "Feedback control of dynamic systems". 3) Jelali Mohieddine: "Hydraulic servo-systems, modeling, identification and control".</p>
Prerequisites	<p>Blackboard. The student must have completed BK60A0001 Mekatroniikan peruskurssi. Recommended BK60A0100 Hydrauliteknikka, BM20A1501 Numeeriset menetelmät I, BM20A4301 Johdatus tekniseen laskentaan, BL10A0100 Sähkötekniikan peruskurssi, BL40A0300 Sääätötekniikan perusteet B and CT60A0200 Ohjelmoinnin perusteet (not required from students of Master's Degree Programme in Mechanical Engineering).</p>
Further Information	<p>This course has 6-10 places for open university students. More information on the web site for open university instruction.</p>

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)	Associate Professor, D.Sc. (Tech.) Kimmo Kerkkänen Professor, D.Sc. (Tech.) Tuomo Kässi Associate Professor, D.Sc. (Tech.) Ville Ojanen Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	At the end of the course a student is expected to know: - how to generate innovations and new technology using and deepening skills learned in other connections. - how to analyze typical methods, problems and their solutions	

Content	- how to apply teamwork in interdisciplinary, international environment for a product and process development project. 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%.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BK70A000	<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 possesses the theories and practices of mathematical modeling and computer simulation of machine systems, which are either hydraulically, pneumatically or electronically actuated. The student is able to utilize simulations as an integrated tool of product design and he can utilize his skills to generalize the theories of engineering design to solve multidisciplinary design tasks. The student is able to compare and justify the use of different constructional solutions for linear and rotating motion mechanism based on their static, kinematic and dynamic analysis. The student is able to individual scientific work to simulate mechatronic machines.
Content	Principles of multibody dynamics, modelling of actuators, coupled simulation. 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. Individual utilization of simulation software, which includes also the principles of how to apply previous mentioned mathematical theories into handling and solving abstract and multidisciplinary problems.
Modes of Study	Lectures 28 h, 3rd-4th period. Teamwork in multi-cultural working environment 30 h, 3rd-4th period. Supervised tutorials 28 h, 3rd-4th period. Independent study 70 h, 3rd-4th period. Total loading 156 h.
Evaluation	0-5, examination or mid-course examinations 80%, simulation work 20%.
Study materials	Lecture notes. Shabana, A. A.: Computational Dynamics, John Wiley & Sons, Inc., 1st edition, 1994. ISBN 0-471-30551-0. Blackboard.
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).
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi

BK80A1200	FE-ANALYSIS COURSE	5 ECTS cr
	FE-analysis course	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Researcher/Teacher, D.Sc. (Tech.) Pasi Tanskanen	
Aims	Students understand the mathematical foundations of finite element analysis and are able to use a commercial finite element program to analyse simple statically loaded mechanical structures.	
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. Independent study 74 h. Overall 130 h.	
Evaluation	0-5, examination 50%, exercises 50%.	
Study materials	The material is to be specified during lectures.	
BK80A1401	FATIGUE DESIGN	6 ECTS cr
	Väsymiskestävyys	
	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	
Aims	The aim of this course is for the student to learn how to design fatigue loaded structures and how to avoid fatigue failure.	
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. Introduction to design and to the fatigue assessment of welded joints. Suitable also for postgraduate studies.	
Modes of Study	Lectures 42 h, 1st-2nd period. Tutorials 40 h, 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.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

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

The Master's Degree Programme in Technomathematics and Technical Physics takes two years, corresponds to 120 ECTS credits and leads to the degree of Master of Science in Technology. The language of tuition in the programme is English. The programme has two alternative major subjects: Technomathematics and Technical Physics.

Technomathematics

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

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.

The professional scope is wide-ranging and growing rapidly, and therefore the aim is to develop the student's mathematical and computational skills for industry and other research and development tasks. The graduate is able to combine modeling, computational skills, advanced theory and data analysis in innovative ways and to provide solutions to questions of industrial R&D. The programme also provides the graduate with capabilities for scientific doctoral studies and independent research.

Education in applied mathematics at LUT is international. A specific goal is to develop university pedagogy in applied mathematics education. The most important fields of education and research are inverse problems, computational material science and statistical/soft modeling. 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.

ECMI Masters in Industrial Mathematics (ECMIMIM) Project

The Laboratory of Mathematics is a partner in the ECMIMIM (the ECMI Masters in Industrial Mathematics) Erasmus curriculum development project. This European network of Master's programmes in mathematics is oriented towards applications in real world, industry, society and environment. The network has agreed on the European Model Curriculum, which will facilitate mobility at the European scale. The LUT students of Technomathematics have a possibility of studying as exchange students in another ECMIMIM partner university abroad.

For more information: www.lut.fi/mathphysics/ecmimim

Degree Structure

General Studies	9	ECTS cr
Major Subject	76	ECTS cr
Minor Subject	20	ECTS cr
Elective Studies	15	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
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3	1-2,	4
	M.Sc. (Tech.) 1-2	3,	3-

80 Technomathematics and Technical Physics

	B.Sc. (Econ. & Bus. Adm.) 3 4, 5
	M.Sc. (Econ. & Bus. Adm.) 1-2
BM20A5000 Principles of Technical Computing and Scientific Publishing	B.Sc. (Tech.) 2 1-2 4 M.Sc. (Tech.) 1

Major in Technomathematics, obligatory studies 44 + 32 ECTS cr

<i>Obligatory Studies (44 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2102	Differential Equations	M.Sc. (Tech.) 1-2	3	6
BM20A2500	Linear Algebra and Normed Spaces	M.Sc. (Tech.) 1-2	1	3
BM20A4000	Case Study Seminar	M.Sc. (Tech.) 1	1-4	5
BM10A0000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

Major Subject, elective modules 32 ECTS cr

The student chooses a minimum of 32 ECTS cr of courses from the modules a-d. The extent of one of the modules should be at least 15 ECTS cr, the rest of the courses can freely be selected from the other modules.

a) Theory of Applied Analysis

<i>List of selectable courses</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A1300	Complex Analysis	M.Sc. (Tech.) 1-2	1	3
BM20A2600	Integral Transforms	B.Sc. (Tech.) 3	4	3
BM20A3301	Stochastic Theory and Models	M.Sc. (Tech.) 1	4	3-5
BM20A3801	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6
BM20A4201	Applied Functional Analysis	M.Sc. (Tech.) 1-2	2-3	4-6

b) Data Driven Modelling

<i>List of selectable courses</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A1900	Statistics II	M.Sc. (Tech.) 1-2	2	3
BM20A2000	Simulation	M.Sc. (Tech.) 1	1	4
BM20A3001	Statistical Analysis in Modelling	M.Sc. (Tech.) 1	2	5
BM20A3401	Design of Experiments	M.Sc. (Tech.) 1-2	4	4
BM20A3801	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6
BM20A3900	Modelling Methodology in Process Engineering	M.Sc. (Tech.) 1	1-2	6

c) Numerical Methods, Optimization and Scientific Computing

<i>List of selectable courses</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2701	Numerical Methods II	M.Sc. (Tech.) 1	3	3
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1-2	3	4
BM20A2901	Discrete Optimization	M.Sc. (Tech.) 1-2	4	5
BM20A3801	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6
BM20A4701	Modelling with Partial Differential Equations	M.Sc. (Tech.) 2	2	4
BM20A5100	Scientific Computing and Numerics for PDEs	M.Sc. (Tech.) 2	4	6

d) Fuzzy Methods and Soft Computing

<i>List of selectable courses</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A2201	Logic and Discrete Methods	M.Sc. (Tech.) 1	1-4	4
BM20A3101	Fuzzy Sets and Fuzzy Logic	M.Sc. (Tech.) 1-2	1-2	6

BM20A3202	Fuzzy Engineering	2 M.Sc. (Tech.) 1- 3-4	6
BM20A3602	Fuzzy Data Analysis	2 M.Sc. (Tech.) 1- 3-4	6
BM20A3801	Advanced Mathematical Methods	2 M.Sc. (Tech.) 1 1-4	3-6
BM20A4500	Evolutionary Computation	M.Sc. (Tech.) 1- 2-3 2	5

Minor Subject 20 ECTS cr

The student can choose any minor subject taught at LUT if the required prerequisites are completed. The choice of the minor subject should, however, be discussed with the Programme Coordinator in Technomathematics.

Elective Studies 15 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 traineeship 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. 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
BM20A2102	Differential Equations	3	6
BM20A2201	Logic and Discrete Methods	1-4	4
BM20A2500	Linear Algebra and Normed Spaces	1	3
BM20A2600	Integral Transforms	4	3
BM20A2701	Numerical Methods II	3	3
BM20A2800	Nonlinear Optimization	3	4
BM20A2901	Discrete Optimization	4	5
BM20A3001	Statistical Analysis in Modelling	2	5
BM20A3101	Fuzzy Sets and Fuzzy Logic	1-2	6
BM20A3202	Fuzzy Engineering	3-4	6
BM20A3301	Stochastic Theory and Models	4	3-5
BM20A3401	Design of Experiments	4	4
BM20A3602	Fuzzy Data Analysis	3-4	6
BM20A3801	Advanced Mathematical Methods	1-4	3-6
BM20A3900	Modelling Methodology in Process Engineering	1-2	6
BM20A4201	Applied Functional Analysis	2-3	4-6
BM20A4500	Evolutionary Computation	2-3	5
BM20A5000	Principles of Technical Computing and Scientific Publishing	1-2	4

82 Technomathematics and Technical Physics

Technical Physics

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

The student majoring in Technical Physics should have a Bachelor's degree from a related field. Each student will make a personal study plan, the contents of which will depend on the student's previous degree/studies and his field of interest and specialization.

The aim of the major subject in Technical Physics is to prepare the student professionally and academically in physics and other technical science skills in industry and R&D tasks. The most important fields of education and research are material physics, applied optics and microelectronics. The programme also provides the graduate with capabilities for scientific doctoral studies and independent research.

Degree Structure

General Studies	9	ECTS cr
Major Subject	65-68	ECTS cr
Minor Subject	20	ECTS cr
Elective Studies	23-26	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 B.Sc. (Econ. & Bus. Adm.) 2-3	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, 5	4
FV18A9101 Finnish 1		1, 3	2

Major in Technical Physics 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
BM10A0000 Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

Minor Subject 20 ECTS cr

The student can choose any minor subject taught at LUT if the required prerequisites are completed. The choice of the minor subject should, however, 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 traineeship 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.

The Degree Structure for Double Degree Students

Degree Structure		
General Studies	5	ECTS cr
Major Subject	66	ECTS cr
Credit Transfer	50	ECTS cr
<i>Total</i>	<i>121 (min.)</i>	<i>ECTS cr</i>

General Studies (5 ECTS cr)

<i>Obligatory Studies (5 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
FV11A8900 Academic Writing in English	B.Sc. (Tech.) 3	1-2, 4	
	M.Sc. (Tech.) 1-2	3, 3-	
	B.Sc. (Econ. & Bus. Adm.) 3	4, 5	
	M.Sc. (Econ. & Bus. Adm.) 1-2		

Major in Technical Physics (for Double Degree Students) 66 ECTS cr

<i>Obligatory Studies (66 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
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	6
	2		
BM30A2200 Semiconductor and Superconductor Physics	M.Sc. (Tech.) 1	1-2	6
BM10A0000 Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

Double degree students come from the LUT partner universities. The student takes his Master's degree from both partnering universities, and will be awarded the degree certificate of LUT and the diploma of the home university. The maximum credit transfer to be accepted to the LUT degree from the previous studies in the student's home university is 50 ECTS cr.

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 ^c Applied Optics	2	6
BM30A1500 ^c Advanced Topics in Material Science	2	6
BM30A1600 ^c Microelectronics	1	6
BM30A2100 Microelectronics Processing Technology	1-2	2
BM30A2200 Semiconductor and Superconductor Physics	1-2	6

^c) Choose a min. of two courses.

Additional Information

Personal Study Plan

The personal study plan (PSP) is the student's own plan how s/he is going to complete the Master's degree. The degree structure of the Master's programme determines the frame of the studies. At the Master's level, the student makes the PSP by the end of 1st period, and submits it to International Study Coordinator for comments. The electronic personal study plan (ePSP, in Finnish eHOPS) is a tool for drawing the plan up. The students of the Faculty of Technology are recommended to compile the PSP in an electronic form by using the ePSP tool at WebOodi.

Credit Transfer

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 International Study Coordinator.

Complementary Studies

The student with a Finnish degree from the University of Applied Sciences or equivalent may have to study complementary studies. The extent of these studies depends on the content of the previous degree. More information is available from International Study Coordinator.

Traineeship

A traineeship in the Master's degree can be worth 6 ECTS credits. A two-week full traineeship is worth one ECTS credit. Employment prior to the studies at LUT may be accepted, if it has not been included in any previous degrees. Acceptable practical work may include computational tasks, measurements and instrumentation, work with experiments, data analysis or tasks which improve the student's understanding of science based methods and technology. The traineeship is approved by traineeship coordinators.

Mathematics: Professor Matti Heiliö

Physics: Lecturer Jari Soininen

Maturity Test

The student must take a maturity test to show how well s/he knows the topic of the Master's thesis. The test evaluates the student's familiarity with the theories and problems of the thesis. The student is asked to contact the supervising professor to agree how the maturity test is taken, that is, as a seminar presentation or as a written test. The maturity test is evaluated on a scale of passed/failed by the supervising professor of the thesis.

Further Information

Programme Coordinator in Technomathematics:
Professor, Ph.D. Matti Heiliö
matti.heilio(at)lut.fi

Programme Coordinator in Technical Physics:
Professor, Ph.D. Erkki Lähderanta
erkki.lahderanta(at)lut.fi

International Study Coordinator, Faculty of Technology:
Ms. Minna Loikkanen
Phone +358 40 8241096, minna.loikkanen(at)lut.fi

The Courses Offered in English

	<i>ECTS cr</i>	
BM10A0000	Master's Thesis and Seminar	30
BM20A1300	Complex Analysis	3
BM20A1900	Statistics II	3
BM20A2000	Simulation	4
BM20A2102	Differential Equations	6
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
BM20A3202	Fuzzy Engineering	6
BM20A3301	Stochastic Theory and Models	3 - 5
BM20A3401	Design of Experiments	4
BM20A3602	Fuzzy Data Analysis	6
BM20A3801	Advanced Mathematical Methods	3 - 6
BM20A3900	Modelling Methodology in Process Engineering	6
BM20A4000	Case Study Seminar	5
BM20A4201	Applied Functional Analysis	4 - 6
BM20A4500	Evolutionary Computation	5
BM20A4800	Project Work in Applied Mathematics	10 - 30
BM20A5000	Principles of Technical Computing and Scientific Publishing	4
BM20A5100	Scientific Computing and Numerics for PDEs	6
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
BM30A2300	Project Work in Technical Physics	10 - 30

BM10A0000	MASTER'S THESIS AND SEMINAR	30 ECTS cr
	Master's Thesis and Seminar, Diplomityö ja seminaari	
Year and Period	M.Sc. (Tech.) 2, Period 1-4	
Teacher(s)	Professor of the major subject Person in Charge: Professor, Ph.D. Matti Heilö	
Aims	Student has general knowledge about a specific field of engineering and applied science in society and is able to apply scientific knowledge and methods in this area. The student is able to work independently, prepare a research plan and operate in a disciplined way.	
Content	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. The thesis is a research or planning project. A report is prepared following the instructions for the Master's thesis. The report contains description of the problem and the context, the used methods, describes the actual analysis and acts of implementation, gives the results and evaluates the outcome and conclusions.	
Modes of Study	The student works independently and keeps contact with the supervisor informing about the progress. The thesis work is presented in a seminar with other thesis students and their instructors. The student gives a brief presentation on the results of his/her project. The presentations are discussed and reviewed by asking questions.	
Evaluation	Research work 300 h, independent study 200 h, report preparation 200 h. 0-5, Master's thesis 100%.	
BM20A1300	COMPLEX ANALYSIS	3 ECTS cr
	Complex Analysis, Kompleksianalyysi	
	The course will be lectured every other year, next during the academic year 2012 - 2013.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1	
Teacher(s)	Docent, D.Sc. (Tech.) Pasi Luukka	
Aims	In the end of the course student is expected to be able to understand - complex numbers and functions, conformal mapping - derivative of a complex function and analytical functions - complex integration, Cauchy's theorem, complex series and Residue theorem - the necessary knowledge of complex analysis needed in technical applications.	
Content	Complex number arithmetics. 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, homework 7 h, preparing to the exam and the exam 29 h, 1st period. Overall 78 h.	
Evaluation	0-5, examination 100%.	
Study materials	Kreyszig, E.: Advanced Engineering Mathematics, 8th Ed., Part D.	
Prerequisites	Recommended Mathematics A and B.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi	

BM20A1900	STATISTICS II	3 ECTS cr
	Statistics II, Tilastomatemiikka II	
Year and Period	M.Sc. (Tech.) 1-2, Period 2	
Teacher(s)	Professor, Ph.D. Matti Heiliö	
Aims	The student acquires understanding of basic and some advanced statistical methods, is able to formulate models and apply these methods to various areas in technology, economics and science. The student is able to perform two-sample tests, analysis of variance, analyze time series data, formulate decision problems using decision tree. The student understands multivariate distributions and is able to perform PCA analysis and factor analysis on multivariate data sets.	
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, independent study and homework 20 h, exam and preparation 10 h, 2nd period. Total 72 h.	
Evaluation	0-5, examination 80%, home assignments 20%.	
Study materials	Will be announced at lectures.	
Prerequisites	Recommended BM20A1401 Tilastomatemiikka I.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi	
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. After the course, the student is able numerically simulate basic queuing, server, scheduling and storage size problems.	
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 21 h, exercises 14 h, homework 21 h, practical assignment 26 h, preparation for examination and the examination 22 h. Total 104 h.	
Evaluation	0-5, examination 100%. Practical assignment.	
Prerequisites	Recommended BM20A1401 Tilastomatemiikka I.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
BM20A2102	DIFFERENTIAL EQUATIONS	6 ECTS cr
	Differential Equations, Differentiaaliyhtälöt	
	Replaces the course BM20A2101 Differential Equations. The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	

88 Technomathematics and Technical Physics

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. After the course, the student is able to solve analytically simple equations, and numerically, using Matlab solvers, ordinary and basic partial differential equations.
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 21 h, exercises 14 h, homework 35 h, practical assignment 38 h, preparation for examination and the examination 22 h. Total 130 h.
Evaluation	0-5, examination 100%. Practical assignment.
Prerequisites	Mathematics A and B.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM20A2201	LOGIC AND DISCRETE METHODS	4 ECTS cr
	Logic and Discrete Methods, Logiikka ja diskreetit menetelmät	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Docent, D.Sc. (Tech.) Pasi Luukka	
Aims	In the end of the course student is expected to be able to understand: - classical logic and resolution method - inductive, recursion and relational methods for computer science - graphs and trees, grammars, formal languages and parsing - resolution method for non-classical logics - applications of number theory to computer science.	
Content	The course consists of classical logic and resolution method, some basic things of non-classical logics, inductive, recursion and relational methods for computer science. An algebraic approach to discrete methods is considered. Suitable also for postgraduate studies.	
Modes of Study	Self study course, studying material and exam, overall 104 h.	
Evaluation	0-5, examination 100%.	
Study materials	Grassmann, W.K., Tremblay J-P.: Logic and Discrete Mathematics. A Computer Science Perspective, Prentice Hall, 1996.	
Prerequisites	Basic knowledge in elementary intuitive set theory.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BM20A2500	LINEAR ALGEBRA AND NORMED SPACES	3 ECTS cr
	Linear Algebra and Normed Spaces, Lineaarialgebra ja normiavaruuudet	
Year and Period	M.Sc. (Tech.) 1-2, Period 1	
Teacher(s)	Professor, Ph.D. Matti Heiliö	
Aims	The student knows the concepts of function spaces, norms, metric and convergence, linear operators, orthogonality, eigenvalues, singular values and decomposition. He/she is able to use these concepts in modeling and analysis of technical systems. Student understands essential principles in various methods of applied mathematics and is able to apply these methods in analysis of functions and signals in areas of differential equations, image analysis, numerical methods and optimization.	
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, independent study and homework 28 h, exam and preparation 10 h, 1st period. Total 73 h.
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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM20A2600	INTEGRAL TRANSFORMS	3 ECTS cr
	Integral Transforms, Integraalimuunnokset	
Year and Period	B.Sc. (Tech.) 3, Period 4	
Teacher(s)	Docent, D.Sc. (Tech.) Pasi Luukka	
Aims	In the end of the course student is expected to be able to - apply Laplace transform to solve differential equations and use this knowledge to solve engineering applications - understand Fourier series and Fourier transform and apply them - understand Z-transform and apply it.	
Content	Laplace transform. Inverse Transform. Linearity. Shifting. Transforms of Derivatives and Integrals. Differential equations. Unit Step Function. Second Shifting Theorem. Dirac's delta function, Differentiation and Integration of Transforms. Convolution. Integral Equations. Partial Fractions. Differential Equations. Fourier series, complex Fourier series, Fourier integrals, Fourier cosine and sine transforms, Fourier transform. Z transform, inverse Z transform, discrete-time systems and difference equations, discrete linear systems, engineering applications.	
Modes of Study	Lectures 28 h, exercises 14 h, homework 7 h, preparing to the exam and the exam 29 h, 4th period. Overall 78 h.	
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.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi	

BM20A2701	NUMERICAL METHODS II	3 ECTS cr
	Numerical Methods II, Numeeriset menetelmät II	
Year and Period	M.Sc. (Tech.) 1, Period 3	
Teacher(s)	D.Sc. (Tech.) Virpi Junttila Person in Charge: Professor, Ph.D. Heikki Haario	
Aims	An introduction to numerical methods for differentiation, integration, interpolation and differential equations. Numerical methods for linear systems. After the course the student understands the basic concepts of numerical analysis, and is able to independently use numerical software (Matlab solvers).	
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, homework 21 h, preparation for examination and the examination 22 h. Total 78 h.	
Evaluation	0-5, examination 100%.	

90 Technomathematics and Technical Physics

Study materials	Will be announced at lectures.
Prerequisites	Mathematics A and B. Recommended BM20A1501 Numeeriset menetelmät I.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM20A2800	NONLINEAR OPTIMIZATION	4 ECTS cr
	Nonlinear Optimization, Epälineaarinen optimointi	
	The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	
Teacher(s)	Lecturer, Lic.Phil. Sirkku Parviainen	
Aims	After the course the student should <ul style="list-style-type: none">- know how formulate and classify nonlinear optimization models- recognize optimum solutions using optimality criteria- be able to understand the principles of optimization algorithms and solve problems of line search, multivariate unconstrained and constrained optimization- know how to use optimization software.	
Content	Formulation of optimization models. Classification of optimization problems. 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. Optimization software tools, examples with Matlab. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 14 h, practical assignment, 3rd period. Homework and practical assignment 42 h. Study and exam 20 h. Total work load 104 h.	
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.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

BM20A2901	DISCRETE OPTIMIZATION	5 ECTS cr
	Discrete Optimization, Diskreetti optimointi	
	The course will be lectured every other year, next during the academic year 2012 - 2013.	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Teacher(s)	Lecturer, Lic.Phil. Sirkku Parviainen	
Aims	After the course the student should <ul style="list-style-type: none">- understand the nature of discrete and combinatorial optimization problems- know the classes of computational complexity and be able to classify problems and algorithms according to their complexity- be able to solve various discrete optimization problems with exact methods and heuristics.	
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	

Modes of Study	simulated annealing methods in discrete optimization. Suitable also for postgraduate studies. Lectures 28 h, exercises 28 h, practical assignment, 4th period. Homework and practical assignment 54 h. Study and exam 20 h. Total work load 130 h.
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.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.

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 modern computational methods of estimating reliability of modeling and simulation results. After the course, the student is able to estimate parameters of nonlinear models by measured data and to create posterior distributions for parameters and model predictions by MCMC (Markov chain Monte Carlo) methods.	
Content	Introduction to the methods of estimating reliability of modelling. 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 21 h, exercises 14 h, homework 35 h, practical assignment 38 h, preparation for examination and the examination 22 h. Total 130 h.	
Evaluation	0-5, examination 100%.	
Study materials	To be given at the lectures.	
Prerequisites	Mathematics A and B, BM20A1401 Tilastomatematiikka I. Recommended BM20A2000 Simulation.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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)	Docent, D.Sc. (Tech.) Pasi Luukka	
Aims	In the end of the course student is expected to be able to - understand the basic mathematics of fuzzy systems - understand relations between crisp and fuzzy sets - understand relations between algebras of crisp and fuzzy sets, some function algebras - understand lattices of membership functions and basics of L-sets - understand non-classical logics and basics 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, fuzzy compositional calculus, ordering fuzzy numbers, introduction to many-valued logics, many-valued fuzzy logic, and fuzzy-valued logic. Suitable also for postgraduate studies.	
Modes of Study	Lectures 56 h, exercises 28 h, homework 28 h, preparing to the exam and the exam 44 h, 1st-2nd period. Overall 156 h.	
Evaluation	0-5, examination 100%.	
Study materials	Nguyen, H.T., Walker, E.A.: A First Course in Fuzzy Logic, 2nd Ed., Chapman	

92 Technomathematics and Technical Physics

Prerequisites Further Information	& 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. Bergmann, M.: An Introduction to Many-Valued and Fuzzy Logic, Cambridge University Press, 2008. Bachelor level basic math courses. This course has 11-15 places for open university students. More information on the web site for open university instruction.	
BM20A3202	FUZZY ENGINEERING	6 ECTS cr
Year and Period Teacher(s) Aims Content Modes of Study Evaluation Study materials Prerequisites Further Information	Fuzzy Engineering, Sumea teknologia Replaces the course BM20A3201 Fuzzy Engineering. The course will be lectured every other year, next during the academic year 2011 - 2012. M.Sc. (Tech.) 1-2, Period 3-4 Docent, D.Sc. (Tech.) Pasi Luukka In the end of the course student is expected to be able to - apply fuzzy systems in engineering environment - apply function approximation methods with fuzzy systems - model and solve control problems and apply neuro-fuzzy systems. 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, aggregation operators, fuzzy screening systems, averaging operators and modifier operations. Neuro-Fuzzy systems. Suitable also for postgraduate studies. Lectures 28 h, exercises 14 h, homework before exercises 7 h, 3rd period. Practical assignment 60 h, preparing to the exam and the exam 47 h, 4th period. Overall 156 h. 0-5, examination 100%. Project work. 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. Recommended BM20A3101 Fuzzy Sets and Fuzzy Logic. This course has 11-15 places for open university students. More information on the web site for open university instruction.	
BM20A3301	STOCHASTIC THEORY AND MODELS	3 - 5 ECTS cr
Year and Period Teacher(s) Aims Content	Stochastic Theory and Models, Stokastiikan teoriaa ja malleja M.Sc. (Tech.) 1, Period 4 Professor, Ph.D. Matti Heiliö Student knows the theory of stochastic models and advanced statistical methods and is able to apply them in analyzing and understanding systems and phenomena containing randomness and uncertainty. Student is able to formulate and analyse reliability models, Markov chain and poisson processes, birth/death models, ARMA models for time series. The student knows the principles of estimation parameters of stochastic models and nonlinear regression. The student learns basics of stochastic calculus and stochastic differential equations. 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	

Modes of Study	and linear statistical models. Analysis and identification of nonlinear statistical models. Bayesian methods. Suitable also for postgraduate studies. Supervised self study course. Lectures 10 h, exercises 14 h, project assignment 20-40 h, self-study material 20-50 h, exam and preparation 10 h, 4th period. Total 74-124 h.
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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM20A3401	DESIGN OF EXPERIMENTS	4 ECTS cr
	Design of Experiments, Koesuunnittelu	
	The course is organized jointly with the Department of Mathematics and Physics and with the Department of Chemical Technology. It covers the design of experiment modules of the courses BJ70A0701 Teollisuus- ja ympäristöanalytiikka I and BJ70AJ110 Design of Experiments and Sampling (postgraduate course).	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Teacher(s)	Professor, Ph.D. Heikki Haario Researcher/Teacher, Docent, D.Sc. (Tech.) Satu-Pia Reinikainen Person in Charge: Professor, Ph.D. Heikki Haario	
Aims	After the course, the student is expected to master the basic skills for effective experimentation, together with regression analysis of data: - understanding of the importance of designed experiments - ability to apply the basic experimental plans, and regression techniques to analyse the results - skills to optimize an engineering process using design of experiments and data analysis.	
Content	Importance of experimental design, minimization of prediction uncertainty of regression models. Basic factorial designs: 2 ^N , Central Composite designs for regression analysis. Mixture designs. The Taguchi principles. Experimental optimisation of engineering processes. Suitable also for postgraduate studies.	
Modes of Study	Lectures 21 h, exercises 14 h, homework 21 h, experimental work in laboratory 26 h, preparation for examination and the examination 22 h. Total 104 h.	
Evaluation	0-5, examination 70%, project work 30%.	
Study materials	Box, G., Hunter, S., Hunter, W. G.: Statistics for Experimenters, Wiley 2005, 2nd Edition.	
Prerequisites	Mathematics A and B, BM20A1401 Tilastomatematiikka I/basic statistics. Basic (Matlab) skills for technical computing with PC.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BM20A3602	FUZZY DATA ANALYSIS	6 ECTS cr
	Fuzzy Data Analysis, Data-analyysiä sumeassa ympäristössä	
	Replaces the course BM20A3601 Fuzzy Data Analysis. The course will be lectured every other year, next during the academic year 2012 - 2013.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4	
Teacher(s)	Docent, D.Sc. (Tech.) Pasi Luukka	

94 Technomathematics and Technical Physics

Aims	In the end of the course student is expected to be able to - understand theoretical aspects of data analysis - understand the principles of multicriteria decision making and is capable of applying them - model and analyze uncertainty in different problem settings - apply fuzzy principal component analysis, fuzzy clustering and classification methods to data analysis problems - apply fuzzy regression analysis.
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 multidecision 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, homework before exercises 14 h, 3rd period. Practical assignment 57 h, preparing to the exam and the exam 29 h, 4th period. Overall 156 h.
Evaluation	0-5, examination 100%. Project work.
Study materials	Bandemer, H., Näther, W.: Fuzzy Data Analysis, Kluwer Academic Publ., 1992.
Prerequisites	Recommended BM20A3101 Fuzzy Sets and Fuzzy Logic.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM20A3801	ADVANCED MATHEMATICAL METHODS	3 - 6 ECTS cr
	Advanced Mathematical Methods, Matemaattisten menetelmien erikoiskurssi	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professor, Ph.D. Matti Heiliö	
Aims	The student will obtain theoretical and operational skills in some specific area of applied mathematics. He understands the methods and knows how to apply the methods to modeling problems in science and engineering.	
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 of learning material 40-60 h, exercises 20-40 h, project assignment and report writing 20-40 h, 1st-4th period. Total 80-140 h.	
Evaluation	0-5, report 100%.	
Prerequisites	Recommended BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
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 M. Sc. (Tech.) Ville Manninen	

Aims	M. Sc. (Tech.) Miika Tolonen Person in Charge: Researcher/Teacher, Ph.D. Tuomo Kauranne The student knows the principles of regression analysis and mathematical modeling in process engineering and is able to build simple mathematical models for chemical processes using Matlab and calibrate their parameters with measurement data.
Content	Types of modelling: empirical and physicochemical models and their uses. 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, parameter estimation and data assimilation. 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 42 h, computer class exercises 28 h, independent study 36 h, completing a practical assignment and writing a report 50 h, exam, 1st-2nd period. Total 156 h.
Evaluation	0-5, examination 70%, practical assignment 30%.
Study materials	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. Svobodny, T.: Mathematical Modeling for Industry and Engineering, Prentice Hall, 1998.
Prerequisites	Mathematics A and B. Recommended BM20A1401 Tilastomatematiikka I, BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta, BM20A2102 Differential Equations.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

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 Researcher/Teacher, Ph.D. Tuomo Kauranne	
Aims	The course gives an introduction to independent scientific work by presenting seminar works from different fields of applied mathematics. After the course, the student is able to prepare and give scientific presentations.	
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. For example, 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. The project work typically is an introduction to the diploma work topic of the student. Suitable also for postgraduate studies.	
Modes of Study	Lectures 42 h, exercises 14 h, homework 38 h, preparation of the presentation 36 h. Total 130 h.	
Evaluation	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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

BM20A4201	APPLIED FUNCTIONAL ANALYSIS	4 - 6 ECTS cr
	Applied Functional Analysis, Sovellettu funktionaalianalyysi	
	Replaces the course BM20A4200 Applied Functional Analysis. The course will be lectured every other year, next during the academic year 2012 - 2013.	
Year and Period	M.Sc. (Tech.) 1-2, Period 2-3	
Teacher(s)	D.Sc. (Tech.) Jouni Sampo	
Aims	Student understands and is able to apply basic methods in some field of applied functional analysis. Specific field may vary, academic year 2012-2013 it is "Wavelets". After course student should: - understand elementary functional analysis and linear algebra behind wavelet frames and bases - understand concept of multiresolution analysis and basic properties of different wavelet bases - be able to implement and apply simple discrete wavelet transform - be able to apply wavelet transform in signal/image compression, de-noising and analysis of singularities.	
Content	Academic year 2010-2011: 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	4 ECTS cr: Lectures 28 h, exercises 28 h, homework 35 h, 2nd period. Exam and preparation for exam 17 h. Total 108 h. 6 ECTS cr: Lectures 28 h, exercises 28 h, homework 35 h, 2nd period. Seminars 7 h and project work and seminar presentation 40 h, 3rd period. Exam and preparation for exam 17 h. Total 155 h.	
Evaluation	0-5, examination 100% (4 ECTS cr). Project work and seminar presentation (6 ECTS cr).	
Study materials	Will be announced at lectures.	
Prerequisites	Recommended BM20A2500 Linear Algebra and Normed Spaces.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	
BM20A4500	EVOLUTIONARY COMPUTATION	5 ECTS cr
	Evolutionary Computation, Evoluutiolaskenta	
	The course will be lectured every other year, next during the academic year 2012 - 2013.	
Year and Period	M.Sc. (Tech.) 1-2, Period 2-3	
Teacher(s)	Saku Kukkonen	
Aims	Upon completion of the course the student will: 1. Understand what evolutionary computation is and what its possibilities/limitations are. 2. Know major types of evolutionary algorithms. 3. Be able to apply evolutionary computation in order to solve practical problems.	
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 55 h and seminars 7 h, preparation for the exercises and exam 26 h, 2nd-3rd period. Total 130 h.
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. Other material given at lectures.
Prerequisites	Good 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.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

BM20A4800	PROJECT WORK IN APPLIED MATHEMATICS 10 - 30 ECTS cr
	Project Work in Applied Mathematics, Soveltavan matematiikan projektityö
Year and Period	M.Sc. (Tech.) 1-2
Teacher(s)	N. N. Person in Charge: Professor, Ph.D. Matti Heiliö
Aims	The student obtains practical skills and advanced knowledge in a specific application area. The student gains experience in project work, team work skills, self management and work discipline.
Content	A specific project which is done in one of the research groups of applied mathematics. The project is planned together with the supervisor(s) and consists of computational research work, model building, literature surveys and report writing. The course may contain lectures and seminars. The project may also be planned together with industry and partly carried out in the environment of the company.
Modes of Study	Research work 100-300 h, independent study 100 h, report preparation 100-200 h.
Evaluation	0-5 or pass/fail, depending on the work performance and project report.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM20A5000	PRINCIPLES OF TECHNICAL COMPUTING AND SCIENTIFIC PUBLISHING 4 ECTS cr
	Principles of Technical Computing and Scientific Publishing, Teknisen laskennan ja julkaisemisen perusteet
Year and Period	B.Sc. (Tech.) 2, M.Sc. (Tech.) 1, Period 1-2
Teacher(s)	Researcher/Teacher, Ph.D. Tuomo Kauranne M. Sc. (Tech.) Matylda Jablonska Person in Charge: Researcher/Teacher, Ph.D. Tuomo Kauranne
Aims	Students get a good hold of principles of scientific computing applied to engineering problems and gain fluency in using related software environments, including scientific publishing.
Content	Solving engineering problems with scientific computing. Computational methods and problem-solving environments. Basics of Mathematical software. Programming constructs. Solving engineering problems with Matlab and Octave. Basics of scientific publishing using LaTeX.
Modes of Study	Lectures 8 h, computer class exercises 16 h, independent study 28 h, completing a practical assignment and writing a report 52 h, 1st-2nd period. Total 104 h.
Evaluation	0-5, exercises 50%, practical assignment 50%.

98 Technomathematics and Technical Physics

Study materials	Gilat, A.: An Introduction to Matlab with Applications.
Prerequisites	Basic University Calculus recommended. Recommended Mathematics A and B or corresponding knowledge.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

BM20A5100	SCIENTIFIC COMPUTING AND NUMERICS FOR 6 ECTS cr PDES
	Scientific Computing and Numerics for PDEs, Tieteellinen laskenta ja ODY-numeriikka
	The course will be lectured every other year, next during the academic year 2011 - 2012.
Year and Period	M.Sc. (Tech.) 2, Period 4
Teacher(s)	Professor, D.Sc. (Tech.) Matti Alatalo Professor, Ph.D. Jari Hämäläinen
Aims	The student knows basic equations of mass and heat flow, physics of electric fields, acoustics, radiation and is able of use physical principles and conservation laws to model multiphysical systems and behaviour of materials, describe boundary conditions and choose ways to describe turbulence and multiscale phenomena. The student is able to implement advanced numerical algorithms for the solutions and work with professional software tools.
Content	The course is connected to the projects in CEID institute and presents the methods of scientific computing and software tools used in CEID-projects. Suitable also for postgraduate studies.
Modes of Study	Lectures 14 h, exercises 28 h, self study 40 h, project assignment 40 h, exam and preparation 10 h, 4th period. Total 132 h.
Evaluation	0-5, project work 50%, exam 50%.
Prerequisites	BM20A2102 Differential Equations BM20A2701 Numerical Methods II Recommended BM20A4100 Vektorianalyysi teknillisessä laskennassa.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM30A0500	APPLIED OPTICS	6 ECTS cr
	Applied Optics, Sovellettu optiikka	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Teacher(s)	Docent, Ph.D. Erik Vartiainen	
Aims	After the course a student: <ul style="list-style-type: none">- knows the basic properties of waves and wave motion- understands the material polarization phenomenon as the ultimate source of light- knows the basic properties and physics of laser action- knows the ideas and applications of ultrafast optics- knows the basic physics and applications of nonlinear optics- knows the Fresnel-equations, and understand accordingly the physics of light reflection and refraction- knows the basics of light polarization, the corresponding applications and the Jones matrix formulation- understands the meaning of spatial and temporal coherence of light, and their implications for the technical applications, such as FTIR spectroscopy- knows the ABCD-matrix formulation for geometrical optics- knows the basics of laser imaging: one- and two-photon confocal microscopy, spectral imaging, and fluorescence nanoscopy- understands the physics of producing slow and fast light, and knows their	

Content	applications - understands diffraction of light, and its applications. Ocular optics. Optical measurement instruments. Interferometry. Polarisation. Diffraction. Fourier optics. The optical properties of materials.
Modes of Study	Lectures 42 h, exercises 14 h, homework 70 h, preparation for the exam 30 h, 2nd period. Total 156 h.
Evaluation	0-5, examination 100%.
Study materials	Pertti Silfsten: Sovellettu optiikka.
Prerequisites	Students are recommended to have completed Physics or Physics L.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

BM30A0601	OPTOELECTRONICS	6 ECTS cr
	Optoelectronics, 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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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 30 h, homework 126 h (5 essays á 25 h 12 min), 2nd period. Total work load 156 h.	
Evaluation	Pass/Fail. Written assignment 100%.	
Study materials	To be given at lectures.	
Prerequisites	BM30A2200 Semiconductor and Superconductor Physics	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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	

100 Technomathematics and Technical Physics

Content	carried out with a suitable design program. 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

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

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

BM30A2200	SEMICONDUCTOR AND SUPERCONDUCTOR PHYSICS	6 ECTS cr
	Semiconductor and Superconductor Physics, Puolijohde- ja suprajohdefysiikka	
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, preparing for exercises 56 h, preparing for the exam 30 h, 1st-2nd period. Total work load 156 h.
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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

BM30A2300	PROJECT WORK IN TECHNICAL PHYSICS	10 - 30 ECTS cr
	Project Work in Technical Physics, Teknillisen fysiikan projektityö	
	The course is mainly intended for foreign visiting students.	
Year and Period	M.Sc. (Tech.) 1-2	
Teacher(s)	N. N. Person in Charge: Professor, Ph.D. Erkki Lähderanta Professor, Ph.D. Tuure Tuuva Docent, Ph.D. Erik Vartiainen	
Aims	The student obtains practical skills and advanced knowledge in a specific application area. The student gains experience in experiments, project work, team work skills, self management and work discipline.	
Content	A specific research work or experiment or project which is done in one of the research groups of technical physics. The experiment is planned together with the supervisor(s) and consists of either experimental work or computational research work with modelling. Additionally is included literature surveys and report writing. The course may contain lectures and seminars. The project may also be planned together with industry and partly carried out in the environment of the company.	
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 work performance and project report.	
Study materials	Literature related to the project.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

5. Faculty of Technology Management

5.1. Master's Degree Programme in Information Technology

Objectives of the Master's Degree Programme in Information Technology

The Degree Programme in Information Technology provides for the students the necessary theoretical and practical knowledge, skills and capabilities required in the IT industry. A person who graduates from the degree programme is also capable of continuing his/her studies in the field of IT. The Degree programme combines up-to-date research knowledge and the fundamentals of computer science and provides this information to the students with modern and efficient teaching methods. The degree Programme has had the label "The Quality Education Unit of Lappeenranta University of Technology" since year 2007.

The degree programme in Information Technology educates and Masters of Science for the needs of industry, research institutions, businesses, and public administration within the field of Information Technology. Master's Degree Programme in Information Technology is divided into three major topics; "Communications Software", "Software Engineering" and "Intelligent Computing". Post-graduate studies are possible in each of the major topics. The general objective of the degree programme is to train efficient teamwork-capable experts and to provide them a solid ground for the independent continuation of learning in the ever-changing field of computer science and IT industry.

Master's Degree Programme in Information Technology 120 ECTS cr

Students in Master's Degree Programme in Information Technology can select one of the following major subjects:

- **Communications software**
- **Intelligent computing**
- **Software engineering**

The graduates from the master's degree programme in Information Technology have a solid foundation in information technology and expertise in the specialities of the major. The graduates are able to work in various roles as members of a group both in domestic and international environments. The learning outcomes in the degree programme are as follows:

Master of Science (Tech.)

- is able to take advantage of the disciplines of scientific consideration and reasoning and is able to exploit scientific approaches and methods
- masters thoroughly the specialities in the selected major
- is able to act as expert and developer in their fields of speciality during the working life
- understands the foundations of the minor subject selected
- owns good skills in communications and proficiency in a language
- owns good skills in ability as a public performer, in knowledge and capabilities in cultural and multinational aspects, team work, project work, and in leadership and management
- owns ability for doctoral studies and life-long learning in working life.

The masters graduated from the programme are able to participate in software projects in the role of an expert or as a leader and they are able to apply their knowledge and capabilities to the challenges in development projects. The graduates are able to apply scientific knowledge and methods in practice, they are able to communicate both orally and in written form (also perform in public) and they are able to participate in a project group also in a multi-cultural environment. The education is given in English language and as such, the graduates can communicate both orally and in written form using English language. Furthermore, each major has the following learning outcomes completing the learning outcomes listed for the full program:

Graduates from Communications Software

- know the structures and operations of various networks and aspects affecting their operation, such as wireless nature, mobility and security

- know the use of services and applications as a part of distributed environment
- know the various communication models and protocols and the ways to use them
- are able to read and produce specifications
- are able to design, model and implement network-enabled services and applications for the distributed environment.

Graduates from Intelligent Computing

- are able to analyze and find solutions for challenging problems in information processing through transforming them into algorithmic form
- are able to apply mathematical methods in algorithms
- are able to apply intelligent and learning approaches of information processing to solve problems in information technology
- are able to use and rationally select solutions and methods in computer vision, computer graphics, compiler construction, machine learning and artificial intelligence.

Graduates from Software Engineering

- can explain the role of software and information systems in the modern society and business
- can apply modern design techniques and methods in daily software engineering
- can participate in software projects as an expert in their specialisation area or as a project manager
- can recognise problems in software development and improve processes in technical, project management, and organisational areas
- can describe the company activities as processes, specify the documents produced in different phases of the development, and adopt suitable measurements to support systematic production.

The study programme for the Master of Science (Tech.) is extended over 2 calendar years with the following schedule:

Year 1. (MSc 1): General studies, studies in the selected major subject, some studies in the selected minor subject, elective studies

Year 2. (MSc 2): Studies in the selected major subject and minor subject, elective studies

General Studies 18 ECTS cr	Major Subject 72 ECTS cr	Minor Subject 20 ECTS cr
		Elective Studies 10 ECTS cr

Elective studies

Studies in other domestic and foreign universities can be accepted as part of the LUT degree based on the approval of a separate application to the Head of the Degree Programme. The students are also advised to follow the offerings by the Open University.

Any courses offered by LUT may be included in elective studies. As a general principle the elective studies should be opted such that they support the other studies. The elective studies complete the requirements of the degree (120 ECTS cr); if the general studies, studies in the major and minor subjects fulfil the requirements for the degree, the optional studies may be 0 ECTS cr.

For more information see the Study Affairs Services webpage of the Faculty:
<http://www.lut.fi/en/technologymanagement/studies/Pages/Default.aspx>.

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

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.

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.

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.

Personal Study Plan

A personal study plan is prepared by the student in the beginning of the studies. The plan includes the courses the student will have in the degree, timing of the studies, and possible compensations. The studies are structured according to the study guide. At LUT, the personal study plan is checked two times during the studies, at the beginning of the studies and when applying for the Master's thesis topic. Students are advised to update the study plan annually in the beginning of the academic year and to check the changes in the curriculum. Further information: Study Secretary Suvi Tiainen, room 4430, phone +358 40 502 2196, suvi.tiainen at lut.fi.

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 108. Further information: Study Secretary Suvi Tiainen.

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	M.Sc. (Tech.) 1	1, 2	2
FV11A8900	Academic Writing in English	M.Sc. (Tech.) 1	1-2	4
FV18A9101 [†]	Finnish 1	M.Sc. (Tech.) 1	1, 3	2

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

5.1.1 MAJOR: Communications Software

<i>Obligatory Studies (56 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT30A5001	Network Programming	M.Sc. (Tech.) 1	1-2	7
CT30A6000	Communications Software, Protocols and Architectures	M.Sc. (Tech.) 1	1-3	8
CT30A8301	Wireless Service Engineering	M.Sc. (Tech.) 1	3-4	7
CT30A9600	Research Methods, Communications Software Laboratory Work	M.Sc. (Tech.) 1-	1-4	4
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

<i>Elective Studies (min. 22 ECTS 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	1-3
CT10A9700	Summer School on Communications Engineering	M.Sc. (Tech.) 2		2
CT30A7500	Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
CT30A8902	Service Oriented Architecture	M.Sc. (Tech.) 2	3-4	5
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1-	1-4 int.	4
CT30A9400	Ad Hoc and Sensor Networks	M.Sc. (Tech.) 2	1-4 (book)	5
CT60A7201	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	7
CT60A7302	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	7
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.) 1	1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1	1-2	5
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4

5.1.2 MAJOR: Intelligent Computing

<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 ECTS 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	1-3
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	7
		2		
CT30A7500	Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
BK70A0000	Simulation of a Mechatronic Machine	M.Sc. (Tech.) 1	3-4	6
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4
BM20A1900	Statistics II	M.Sc. (Tech.) 1-	2	3
		2		
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1-	3	4
		2		
BM20A2901	Discrete Optimization	M.Sc. (Tech.) 1-	4	5
		2		
BM20A4201	Applied Functional Analysis	M.Sc. (Tech.) 1-	2-3	4-6
		2		
BM30A0500	Applied Optics	M.Sc. (Tech.) 1	2	6

5.1.3 MAJOR: Software Engineering

<i>Obligatory Studies (56 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT60A7201	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	7
CT60A7302	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	7
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 22 ECTS 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	1-3
CT10A9601	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT30A5001	Network Programming	M.Sc. (Tech.) 1	1-2	7
CT30A6000	Communications Software, Protocols and Architectures	M.Sc. (Tech.) 1	1-3	8
CT30A7500	Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
CT30A8301	Wireless Service Engineering	M.Sc. (Tech.) 1	3-4	7
CT30A8902	Service Oriented Architecture	M.Sc. (Tech.) 2	3-4	5
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1-2	1-4 int.	4
CT30A9400	Ad Hoc and Sensor Networks	M.Sc. (Tech.) 2	1-4 (book)	5
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
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4

Minor Subject, 20 ECTS credits

The minor subject can be selected freely either from Information Technology or from any other minor subject listed in page 274.

Information Technology:

- major Communications Software: minor either Intelligent Computing or Software Engineering
- major Intelligent Computing: minor either Communications Software or Software Engineering
- major Software Engineering: minor Communications Software or Intelligent Computing.

Minor: Communications Software

<i>Elective, (min. 20 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
CT10A9700	Summer School on Communications Engineering		2
CT30A5001	Network Programming	1-2	7
CT30A6000	Communications Software, Protocols and Architectures	1-3	8
CT30A8301	Wireless Service Engineering	3-4	7
CT30A8902	Service Oriented Architecture	3-4	5
CT30A9300	Code Camp on Communications Engineering	1-4 int.	4

Minor: Intelligent Computing

<i>Elective, (min. 20 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
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
CT50A6400	Compiler Construction	3-4	7
BM20A1900	Statistics II	2	3

Minor: Software Engineering

Elective, (min. 20 ECTS cr)		<i>per.</i>	<i>ECTS cr</i>
CT30A5001	Network Programming	1-2	7
CT30A9300	Code Camp on Communications Engineering	1-4 int.	4
CT60A7201	Architecture in Systems and Software Development	3-4	7
CT60A7302	Software Quality, Processes, and Organizations	1-2	7
CT60A7400	Fundamentals of Information Systems	1-2	7
CT60A7500	Object-Oriented Programming Techniques	1-2	5

If the student selects one of the minors from other faculties, the student should also check the pre-requisites! The course descriptions and description of the minors can be found in this study guide in the section dedicated to each Master's programme. Additional information is provided by the study counselling staff of each Master's programme. Please see page 9.

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.

The minimum of the degree is 120 ECTS credits. Elective studies are selected such that minimum 120 ECTS credits are completed.

Complementary Studies

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies (21 ECTS cr) which are not included in the Master's degree.

Complementary Studies

<i>Obligatory studies (21 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20A0500	Matematiikka KoTiB1	B.Sc. (Tech.) 1	3	3
BM20A0700	Matematiikka KoTiB2	B.Sc. (Tech.) 1	3-4	2
BM20A0900	Matematiikka KoTiB3	B.Sc. (Tech.) 1	4	3
BM20A1401	Tilastomatematiikka I	B.Sc. (Tech.) 2	1	3
CT50A2310	Tietorakenteet ja algoritmit	B.Sc. (Tech.) 2	2	5
CT50A3000	Unix and System Programming	B.Sc. (Tech.) 3	2 int.	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 Finnish and Russian universities.

The partners in the programme are:

- St. Petersburg State University
- St. Petersburg State Polytechnic University
- Petrozavodsk State University
- Lappeenranta University of Technology
- University of Eastern Finland
- University of Helsinki

The objective of the study programme is to offer in each of the partner 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, and a M.Sc. Thesis. The total amount is 120 ECTS credits. The curriculum contains 60 ECTS credits of studies that are produced in cross-border collaboration. At Lappeenranta University of Technology, the alternative major subjects are Communications Software, Intelligent Computing, 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. thesis projects

Personal Study Plan

At the beginning of their studies, students prepare a personal study plan (PSP). Personal study plans will be approved by the academic director, D.Sc. Arto Kaarna, who will give further information on how to prepare and update the personal study plan.

Complementary Studies

Students with a Finnish degree from the University of Applied Sciences or equivalent will have to study complementary studies (21 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 108. Further information: Study Secretary Suvi Tiainen, room 4430, phone +358 40 502 2196, suvi.tiainen at lut.fi.

CBU-ICT courses

CBU-ICT courses offered in different partner universities are available on the website <http://cs.joensuu.fi/CBU/>

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	M.Sc. (Tech.) 1	1, 2	2
FV11A8900 Academic Writing in English	M.Sc. (Tech.) 1	1-2	4
FV18A9101 [†] Finnish 1	M.Sc. (Tech.) 1	1, 3	2

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

5.2.1 MAJOR: Communications Software

<i>Obligatory Studies (56 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT30A5001 Network Programming	M.Sc. (Tech.) 1	1-2	7
CT30A6000 Communications Software, Protocols and Architectures	M.Sc. (Tech.) 1	1-3	8
CT30A8301 Wireless Service Engineering	M.Sc. (Tech.) 1	3-4	7
CT30A9600 Research Methods, Communications Software Laboratory Work	M.Sc. (Tech.) 1-2	1-4	4
CT10A6000 Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

<i>Elective Studies (min. 22 ECTS 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	1-3
CT10A9700 Summer School on Communications Engineering	M.Sc. (Tech.) 2		2
CT30A7500 Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
CT30A8902 Service Oriented Architecture	M.Sc. (Tech.) 2	3-4	5
CT30A9300 Code Camp on Communications Engineering	M.Sc. (Tech.) 1-2	1-4 int.	4
CT30A9400 Ad Hoc and Sensor Networks	M.Sc. (Tech.) 2	1-4 (book)	5

CT60A7201	Architecture in Systems and Software Development	M.Sc. (Tech.)	1	3-4	7
CT60A7302	Software Quality, Processes, and Organizations	M.Sc. (Tech.)	2	1-2	7
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.)	1	1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.)	1	1-2	5
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.)	2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.)	1	1-2	4

5.2.2 MAJOR: Intelligent Computing

<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 ECTS 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	1-3
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	7
			2		
CT30A7500	Parallel Computing	M.Sc. (Tech.)	2	1-4	5
				(book)	
BK70A0000	Simulation of a Mechatronic Machine	M.Sc. (Tech.)	1	3-4	6
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.)	2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.)	1	1-2	4
BM20A1900	Statistics II	M.Sc. (Tech.)	1-	2	3
			2		
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.)	1-	3	4
			2		
BM20A2901	Discrete Optimization	M.Sc. (Tech.)	1-	4	5
			2		
BM20A4201	Applied Functional Analysis	M.Sc. (Tech.)	1-	2-3	4-6
			2		
BM30A0500	Applied Optics	M.Sc. (Tech.)	1	2	6

5.2.3 MAJOR: Software Engineering

<i>Obligatory Studies (56 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>	
CT60A7201	Architecture in Systems and Software Development	M.Sc. (Tech.)	1	3-4	7
CT60A7302	Software Quality, Processes, and Organizations	M.Sc. (Tech.)	2	1-2	7
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 22 ECTS 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	1-3
CT10A9601	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT30A5001	Network Programming	M.Sc. (Tech.) 1	1-2	7
CT30A6000	Communications Software, Protocols and Architectures	M.Sc. (Tech.) 1	1-3	8
CT30A7500	Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
CT30A8301	Wireless Service Engineering	M.Sc. (Tech.) 1	3-4	7
CT30A8902	Service Oriented Architecture	M.Sc. (Tech.) 2	3-4	5
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1-2	1-4 int.	4
CT30A9400	Ad Hoc and Sensor Networks	M.Sc. (Tech.) 2	1-4 (book)	5
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
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4

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

Student selects courses lectured at the Russian CBU-ICT partner universities, from the CBU Winter and Summer Schools, visiting lectures and intensive courses. Also courses provided by LUT are possible when they support the general objectives of the CBU-ICT programme. The minors of Business and Technology in Russia and Russia and Transitional Economies: Business Environment are recommended. Please see pages 276-277 for these minor subjects. The minor is designed along with the personal study plan.

Elective Studies 10 ECTS cr

Student selects 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 credits.

For CBU-courses, please see: <http://cs.joensuu.fi/CBU/>

5.3. Fenno-Russian Master's Degree Programme in Information Technology 2011 – 2012 (FRIT)

FRIT is a double degree programme between LUT and the partner universities in Russia. The students will study one year at their home university and then come to LUT for the second year to specialize in one of the three major subjects offered. Student is expected to complete the Master's thesis according to LUT practices. Please, see page 283 for Final thesis instructions.

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

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

Master of Science 120 ECTS cr

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

Compensation of the first year studies at the home university to LUT degree totaling to 50 ECTS credits are included as follows:

General studies 12 ECTS cr

Major subject 8 ECTS cr

Minor subject 20 ECTS cr

Elective studies 10 ECTS cr

Major Subject 70 ECTS credits

5.3.1 MAJOR: Communications Software

<i>Obligatory Studies (56 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT30A5001	Network Programming	M.Sc. (Tech.) 1	1-2	7
CT30A6000	Communications Software, Protocols and Architectures	M.Sc. (Tech.) 1	1-3	8
CT30A8301	Wireless Service Engineering	M.Sc. (Tech.) 1	3-4	7
CT30A9600	Research Methods, Communications Software Laboratory Work	M.Sc. (Tech.) 1-	1-4	4
CT10A6000	Master's Thesis and Seminar	M.Sc. (Tech.) 2	1-4	30

<i>Elective studies (min. 14 ECTS 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	1-3
CT10A9700	Summer School on Communications Engineering	M.Sc. (Tech.) 2		2
CT30A7500	Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
CT30A8301	Wireless Service Engineering	M.Sc. (Tech.) 1	3-4	7
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1-	1-4 int.	4
		2		

114 Information Technology

CT30A9400	Ad Hoc and Sensor Networks	M.Sc. (Tech.) 2	1-4 (book)	5
CT60A7201	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	7
CT60A7302	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	7
CT60A7400	Fundamentals of Information Systems	M.Sc. (Tech.) 1	1-2	7
CT60A7500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1	1-2	5
CT30A8902	Service Oriented Architecture	M.Sc. (Tech.) 2	3-4	5
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4

5.3.2 MAJOR: Intelligent Computing

<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. 14 ECTS 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	1-3
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
CT30A7500	Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
BK70A0000	Simulation of a Mechatronic Machine	M.Sc. (Tech.) 1	3-4	6
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4
BM20A1900	Statistics II	M.Sc. (Tech.) 1-2	2	3
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1-2	3	4
BM20A2901	Discrete Optimization	M.Sc. (Tech.) 1-2	4	5
BM20A4201	Applied Functional Analysis	M.Sc. (Tech.) 1-2	2-3	4-6
BM30A0500	Applied Optics	M.Sc. (Tech.) 1	2	6

5.3.3 MAJOR: Software Engineering

<i>Obligatory Studies (56 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CT60A7201	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	7
CT60A7302	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	7
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. 14 ECTS 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	1-3
CT10A9601	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	1-4	1-5
CT30A5001	Network Programming	M.Sc. (Tech.) 1	1-2	7
CT30A6000	Communications Software, Protocols and Architectures	M.Sc. (Tech.) 1	1-3	8
CT30A7500	Parallel Computing	M.Sc. (Tech.) 2	1-4 (book)	5
CT30A8301	Wireless Service Engineering	M.Sc. (Tech.) 1	3-4	7
CT30A8902	Service Oriented Architecture	M.Sc. (Tech.) 2	3-4	5
CT30A9300	Code Camp on Communications Engineering	M.Sc. (Tech.) 1-2	1-4 int.	4
CT30A9400	Ad Hoc and Sensor Networks	M.Sc. (Tech.) 2	1-4 (book)	5
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
BL40A1000	Real-time Operating Systems and Programs	M.Sc. (Tech.) 2	1-2	5
BL40A1100	Embedded System Programming	M.Sc. (Tech.) 1	1-2	4

5.4. Courses Offered in English in Information Technology

		<i>ECTS cr</i>
CT10A0010	Laboratory Work Course in Information Technology	10 - 30
CT10A1100	CBU Summer/Winter School in Information Technology	1 - 7
CT10A6000	Master's Thesis and Seminar	30
CT10A9100	ECSE International Summer School in Novel Computing	1 - 3
CT10A9500	Research Methods	3
CT10A9601	Research Methods, Laboratory Project	1 - 5
CT10A9700	Summer School on Communications Engineering	2
CT30A5001	Network Programming	7
CT30A6000	Communications Software, Protocols and Architectures	8
CT30A7500	Parallel Computing	5
CT30A8301	Wireless Service Engineering	7
CT30A8902	Service Oriented Architecture	5
CT30A9300	Code Camp on Communications Engineering	4
CT30A9400	Ad Hoc and Sensor Networks	5
CT30A9600	Research Methods, Communications Software Laboratory Work	4
CT50A3000	Unix and System Programming	5
CT50A4000	Introduction to Intelligent Computing	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
CT60A4101	Software Engineering Methods	5
CT60A5000	E-Business Technologies	5
CT60A7201	Architecture in Systems and Software Development	7
CT60A7302	Software Quality, Processes, and Organizations	7
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: Professor, D.Sc. (Tech.) Ville Kyrki, Professor, D.Sc. (Tech.) Jari Porras and Professor, Ph.D. Kari Smolander	
Aims	Student has 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, self-study 260-840 h.	
Evaluation	0-5 or passed/failed.	
Study materials	Literature related to the project.	
CT10A1100	CBU SUMMER/WINTER SCHOOL IN INFORMATION TECHNOLOGY	1 - 7 ECTS cr
	CBU Summer/Winter School in Information Technology, Tietotekniikan CBU kesä- tai talvikoulu	
	Intensive course in summer and/or winter.	
Year and Period	Period 1-4	
Teacher(s)	Person in Charge: Adjunct Professor, D.Sc. (Tech.) Arto Kaarna	
Content	Content changes every year. Lectures will be held by international lecturers.	
Modes of Study	Lectures and/or exercises, and/or practical assignments. Total amount 26-182 h.	
Evaluation	0 - 5 or passed/failed. Participation. Practical assignment and/or exercises and/or exam.	
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.) Ville Kyrki, Professor, D.Sc. (Tech.) Jari Porras and Professor, Ph.D. Kari Smolander	
Aims	A student is able to 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. Kyrki), 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.	
Modes of Study	Master's Thesis and a seminar presentation, maturity exam. Total amount 780 h.	
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 - 3 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.) Joni Kämäräinen	
Aims	The learning outcomes of the course are as follows: A student understands the scientific basics, current research activities and application areas of one of the selected topics of the summer school, and can further apply this knowledge in his/her research work. A student knows the practices of an international summer school.	
Content	Content changes every year. Lectures will be held by visiting international lecturers. Suitable also for postgraduate studies.	
Modes of Study	Lectures and/or exercises and/or practical assignments. A student must register to the course directly via the web page of the summer school. Total amount 26-78 h.	
Evaluation	Passed/failed. Participation and practical assignments.	
Study materials	http://cs.joensuu.fi/ecse/	
CT10A9500	RESEARCH METHODS	3 ECTS cr
	Research Methods, Tutkimusmenetelmät	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Adjunct Professor, D.Sc. (Tech.) Arto Kaarna	
Aims	Student can describe concepts and methods in research. Student understands aspects in scientific reporting. Student can prepare a research plan.	
Content	Research work, philosophy of research. Research process. Designing re- search, research questions and hypothesis. Qualitative and quantitative re- search methods. Reporting scientific work.	
Modes of Study	Lectures 14 h, lecture preparation 7 h, 1st period. Practical assignments: 42 h, 2nd period. Exam preparation 12 h. Exam 3 h. Total amount 78 h. Blackboard is used in this course.	
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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
CT10A9601	RESEARCH METHODS, LABORATORY PROJECT	1 - 5 ECTS cr
	Research Methods, Laboratory Project, Tutkimusmenetelmät, laboratorioprojekti	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Teacher(s)	Professor, D.Sc. (Tech.) Ville Kyrki, Professor, D.Sc. (Tech.) Jari Porras and Professor, Ph.D. Kari Smolander.	
Aims	Student is able to execute a well-defined research task in Communications	

Content	Software, Machine Vision and Pattern Recognition, or Software Engineering Laboratory. 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. Kyrki), 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. Total amount 26-130 h.
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.

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	Students are expected to understand the meaning of the yearly changing topic of the summer school in the field of communications. Students are able to review the presentations as well as to apply the received knowledge in the implementation of their own application. Students are able to clearly present their ideas both in written and in oral form.
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 12 h. Total amount 52 h.
Evaluation	Passed/failed, practical assignment and report 100%.
Study materials	http://www.it.lut.fi/ssotc/
Prerequisites	Basic programming skills. Recommended CT10A9500 Research Methods.

CT30A5001	NETWORK PROGRAMMING 7 ECTS cr
	Network Programming, Tietoliikenneohjelmointi
	Replaces the course CT30A5000 Network Programming.
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Teacher(s)	Adjunct Professor, D.Sc. (Tech.) Jouni Ikonen
Aims	Students understand problematics of networked applications, and are able 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. Time used for assignments 150 h. Total amount 182 h.
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. Understanding of TCP/IP protocol family.
Further Information	Recommended CT50A3000 Unix and System Programming. Enrolment to tutorial groups in WebOodi

CT30A6000	COMMUNICATIONS SOFTWARE, PROTOCOLS 8 ECTS cr AND ARCHITECTURES
	Communications Software, Protocols and Architectures, Tietoliikenneohjelmistot ja -protokollat
Year and Period	M.Sc. (Tech.) 1, Period 1-3
Teacher(s)	Associate Professor, D.Sc. (Tech.) Kari Heikkinen
Aims	The student obtains basic knowledge about the development of communications software and protocols. The student understands the fundamentals of communications software and the main methods to describe the internal and external behavior of protocols. The student is able to write specifications for communication software interfaces and model and program communications software. The student understands the importance of basic testing and verification methods.
Content	Protocol Design. Message Sequence Charts. State Machines. Abstract Syntax Notation 1. Connectionless and Connection-oriented Software. Protocol Layering Architectures. Concurrency in Communication. Communication Software Programming. Implementation of State machines. Protocol Testing and Conformance Testing.
Modes of Study	Contact teaching (L 20 h + E 12 h) 32 h, 1. period. Contact teaching (L 8 h + E 14 h) 22 h, specification (in group) 39 h, 2. period. Contact teaching (L 1 h + E 10 h) 11 h, implementing the specification (in group) 52 h, self-study 39 h, 3. period. Preparations to exam 10 h and exam 3 h. Total amount 208 h.
Evaluation	0 - 5. Specification and implementation (40%) and exam (60%).
Study materials	Pallapa Venkataram, P Sunilkumar S. Manvi, Communication Protocol Engineering, 2004, Prentice-Hall
Prerequisites	Recommended CT30A2002 Tietoliikennetekniikan perusteet, CT50A3000 Unix and System Programming, CT60A4001 Ohjelmistotuotanto.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

CT30A7500	PARALLEL COMPUTING	5 ECTS cr
	Parallel Computing, Rinnakkaislaskennan perusteet	
	Replaces the courses CT30A7001 Concurrent and Parallel Programming, CT30A7000 Parallel Computing and Ti5317000 Parallel Computing.	
Year and Period	M.Sc. (Tech.) 2, Period 1-4 (book)	
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	Students are expected to understand the concept of concurrency and the meaning, concepts as well as applications of parallel and distributed computing. Students know the different parallel architectures and their usage. Students are able to apply their knowledge on various algorithms to different application problems. Students have basic knowledge on parallel programming.	
Content	Emerging need for parallel computing, parallel architectures and their classification, performance meters and scalability as well as general view of pro-	

Modes of Study	programming in parallel environment. Suitable also for postgraduate studies. Book based course, self-study 127 h. Exam 3 h. Total amount 130 h.
Evaluation	0 - 5. Exam 100%.
Study materials	Grama, A. et al.: Introduction to Parallel Computing, Addison-Wesley, 2003.

CT30A8301	WIRELESS SERVICE ENGINEERING	7 ECTS cr
	Wireless Service Engineering, Langattomien palveluiden tekniikka	
	Replaces the course CT30A8300 Wireless Service Engineering.	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Associate Professor, D.Sc. (Tech.) Pekka Jäppinen	
Aims	The student understands the challenges that wireless communication technologies and mobile devices provide to service development. He/she learns methods to create and improve services for wireless environment.	
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 personalization, context awareness, location. Suitable also for postgraduate studies.	
Modes of Study	Lectures 28 h, exercises 14 h, practical assignment part 1 20 h, 3. period. Lectures 14 h, exercises 14 h, practical assignment part 2 30 h, 4. period. Self-study 49 h, preparation for exam 10 h and exam 3 h. Total workload 182 h.	
Evaluation	0 - 5. Exam 50 %, practical assignments 50 %.	
Study materials	Material announced in lectures.	
Prerequisites	CT30A5001 Network Programming.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

CT30A8902	SERVICE ORIENTED ARCHITECTURE	5 ECTS cr
	Service Oriented Architecture, Palvelukeskeinen arkkitehtuuri	
Year and Period	M.Sc. (Tech.) 2, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	Students are expected to understand the meaning of service-oriented paradigm and the aspects affecting the efficient utilization of it. Students are able to design and implement service-oriented applications.	
Content	Service and web oriented architecture terminology, technologies and infrastructures. SOA and web services fundamentals, SOA and WS-* extensions, SOA and Service-orientation, designing and building SOA. Suitable also for postgraduate studies.	
Modes of Study	Lectures 21 h, lecture preparation 10 h, exercises 14 h, exercise preparation 14 h, practical assignment 26 h. 3.-4. period. Self-study 32 h, exam preparation 10 h, exam 3 h. Total amount 130 h.	
Evaluation	0 - 5. Exam 60 %, practical assignments 40 %.	
Study materials	Erl, T. Service-Oriented Architecture: Concepts, Technology and Design, Prentice-Hall, 2005.	
Prerequisites	Recommended CT30A3200 WWW-sovellukset .	

CT30A9300	CODE CAMP ON COMMUNICATIONS ENGINEERING	4 ECTS cr
	Code Camp on Communications Engineering, Tietoliikennetekniikan code camp	

	The course is arranged intensively 1-4 times/year.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-4 int.	
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 selected topic of the course. After the course students are expected to be able to use the achieved knowledge on the topic in their work and to implement other projects with the technology.	
Content	Topic varies. Due to the changing topic this course may be studied multiple times, but only with the different content.	
Modes of Study	Lectures and demonstrations, project work, presentation and reporting 52 h, self-study 52 h. Total amount 104 h.	
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.) 2, Period 1-4 (book)	
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	Students are expected to understand the fundamental principles of wireless ad hoc and sensor networks as well as 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. Suitable also for postgraduate studies.	
Modes of Study	Book based course, self-study 127 h. Exam 3 h. Total amount 130 h.	
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.	
CT30A9600	RESEARCH METHODS, COMMUNICATIONS SOFTWARE LABORATORY WORK	4 ECTS cr
	Research Methods, Communications Software Laboratory Work, Tietoliikenneohjelmistojen laboratoriotyö	
	Can not be included in the same degree as CT10A9600 Research Methods, Laboratory Project. Only for the students, whose major is Communications Software.	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-4	
Teacher(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	Student is able to plan scientific research project on a given topic and is capable of working as a member of a research team to execute the research in scientific manner. Student is able to document the work as a scientific report and has the ability the present the results of the work for critical audience.	
Content	Research work in the topic defined by the laboratory. Topics will be linked to the strategic research areas and ongoing and starting research projects of the Communications software laboratory. When starting contact the head of the laboratory.	
Modes of Study	Participation in the work of the research group, 1st-4th period.	

Evaluation	Self-study 104 h.
Study materials	Passed/failed. Research plan, research report and presentation. Literature related to the research topic, agreed with the supervisor of the work.
CT50A3000	UNIX AND SYSTEM PROGRAMMING 5 ECTS cr
	Unix and System Programming, Unix ja systeemiohjelmointi
	The course is lectured intensively on week 42.
Year and Period	B.Sc. (Tech.) 3, Period 2 int.
Teacher(s)	Professor, D.Sc. (Tech.) Joni Kämäräinen
Aims	Students can write Unix programs using C language and utilise fundamental Unix libraries and system level functions in their programs. Students can write shell scripts. Students can do basic administration of Unix systems.
Content	Basic structure of Unix system. C programming environment and tools in Unix. Unix shells (Bash), shell programming, shell script programming, regular expressions and basic utilities (e.g. Sed, Awk, etc.) File I/O. Files and directories. Standard I/O library. System data files and information. Process environment. Process control. Process relationships. Signals. Threads and thread control. Daemon processes. Advanced I/O. Interprocess communication and sockets.
Modes of Study	Lectures 21 h, exercises 14 h, exercise preparation 14 h and homeworks 10 h. Practical assignment 40 h. Self-study 28 h. Exam 3 h. Total amount 130 h.
Evaluation	0 - 5. Exam 100 %. Homeworks and practical assignment.
Study materials	Stevens and Rago, 2005: Advanced Programming in the UNIX Environment, 2nd edition, W. Richard Stevens and Stephen A. Rago, 2005. Quigley, 2005: Unix Shells by Example, 4th edition, Ellie Quigley, 2005.
Prerequisites	CT60A0210 Käytännön ohjelmointi, CT50A2602 Käyttöjärjestelmät or equivalent.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.
CT50A4000	INTRODUCTION TO INTELLIGENT COMPUTING 5 ECTS cr
	Introduction to Intelligent Computing, Johdatus älykkääseen laskentaan
Year and Period	B.Sc. (Tech.) 2-3, Period 3-4
Teacher(s)	Professor, D.Sc. (Tech.) Joni Kämäräinen
Aims	Students know the principles of intelligent systems and hardware and software parts required to build intelligent systems. Students know robotic paradigms and navigation methods required of AI robots. Students can use the basic theorems of machine learning and devise procedures for machine learning and computational intelligence. Students know the work flow of computer vision and are able to capture and process digital images. With the help of programming skills the students are able to implement the learned techniques as runnable programs in intelligent systems.
Content	Basic structure of intelligent systems. Basics of computer vision. Basics of machine learning. Robotic paradigms. Robot navigation. Visual sensing and parts of computer vision systems. 3D vision and basic image processing. Principles of machine learning. Concept learning. Decision tree learning. Data clustering and unsupervised learning. Learning sets of rules and expert systems. Black box methods and genetic algorithms. Bayesian learning.
Modes of Study	Lectures 42 h, exercises 28 h, exercise preparation 28 h and homeworks 10 h, 3rd-4th period. Self-study 19 h. Exam 3 h. Total amount 130 h.

Evaluation	0 - 5. Exam 100 %. Exercises and homeworks.
Study materials	Murphy, 2000: Introduction to AI Robotics, Robin R. Murphy, MIT Press, 2000. Davies, 2005: Machine Vision, E.R. Davies, 3rd edition, Elsevier, 2005. Mitchell, 1997: Machine Learning, Tom Mitchell, McGraw-Hill, 1997.
Prerequisites	Matematiikka A and B, CT60A0200 Ohjelmoinnin perusteet or equivalent.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

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)	Adjunct Professor, D.Sc. (Tech.) Arto Kaarna
Aims	Student knows the basic algorithms and methods in 2D/3D computer graphics. Student can apply both a graphics library and a software package in composing 3D scenes.
Content	Examples and applications of computer graphics. Introduction to two-dimensional graphics. Principals of graphics hardware. Raster graphics. Introduction to modeling of three-dimensional objects. Algorithms in three-dimensional graphics. Open GL graphics library.
Modes of Study	Lectures 21 h, lecture preparation 7 h, exercises 14 h, solutions for the exercises 14 h, Practical assignments 56 h, 2nd period. Self-study 15 h, exam 3 h. Total amount 130 h.
Evaluation	0 - 5. Exam 100 %. Exercises and practical assignments.
Study materials	Hearn, D., Baker, M.P., Carithers, W.: Computer Graphics with OpenGL, Prentice-Hall, 4th edition, 2010. 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi

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	A student can analyze a pattern recognition problem, choose a suitable pattern recognition method, and implement a solution. A student can analyze the performance and quality of a pattern recognition system.
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, lecture preparation 14 h, exercises 14 h, exercise preparation 28 h, 3. period. Lectures 21 h, lecture preparation 14 h, exercises 14 h, exercise preparation 28 h, practical assignment 18 h, 4. period. Self-study 7 h. Exam 3 h. Total amount 182 h.
Evaluation	0 - 5. Exam 50 %, exercises 50 %.
Study materials	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.

Further Information	Recommended BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta, or equivalent knowledge. This course has 1-5 places for open university students. More information on the web site for open university instruction.
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 other year, next during the academic year 2011 - 2012.
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2
Teacher(s)	D.Sc. (Tech.) Leena Ikonen
Aims	After the course a student is expected to be able to explain the fundamental steps of image processing and analysis, to implement solutions to the steps using Matlab, to introduce and compare machine vision applications, to plan a solution to a given object recognition problem, and to implement the solution using Matlab or other suitable programming language.
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 seminars 4 h, 2nd period. Preparation for the seminar presentation and acting as an opponent, homework, and practical assignment 79 h, self-studying of taught matters and relevant literature and preparation for the exam 28 h, 1st and 2nd period. Exam 3 h. Total amount 182 h.
Evaluation	0 - 5. Exam 50 %, exercises 50 %. Seminar presentation. 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, CT50A6200 Computer and Robot Vision.
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 other year, next during the academic year 2012 - 2013.
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2
Teacher(s)	Professor, D.Sc. (Tech.) Ville Kyrki
Aims	A student understands the theoretical basis of geometric and dynamic computer vision, and can apply the knowledge to solve practical computer vision problems. A student can explain basic approaches and applications of vision in robotics.
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, lecture preparation 7 h, exercises 14 h, exercise preparation 25

	h, 1. period. Lectures 21 h, lecture preparation 7 h, exercises 14 h, exercise preparation 25 h, practical assignment 26 h, 2. period. Exam preparation 19 h, exam 3 h. Total amount 182 h.
Evaluation	0 - 5. Exam 50 %, exercises 50 %. Practical assignment.
Study materials	Lecture notes.
Prerequisites	Trucco, E., Verri, A.: Introductory Techniques for 3-D Computer Vision, Prentice-Hall, 1998. Matematiikka A and B, CT60A0200 Ohjelmoinnin perusteet. Recommended BM20A1401 Tilastomatematiikka I, BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta or equivalent knowledge.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

CT50A6400	COMPILER CONSTRUCTION	7 ECTS cr
	Compiler Construction, Kääntäjätekniiikat	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Teacher(s)	Adjunct Professor, D.Sc. (Tech.) Arto Kaarna	
Aims	Student understands structures and operations in compilation. Student can implement a compiler using high-level tools.	
Content	Languages and grammars. Regular languages and lexical analysis. Introduction to parsing. Syntax directed translation, attribute grammars, intermediate representation, target language. Machine independent optimization. Tools for compiler construction.	
Modes of Study	Lectures 21 h, lecture preparation 14 h, exercises 14 h, 3rd period. Lectures 21 h, lecture preparation 14 h, exercises 14 h, assignment 72 h, 4th period. Exam preparation 9 h, exam 3 h. Total amount 182 h.	
Evaluation	0 - 5. Exam 100 %. Exercises and project.	
Study materials	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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi	

CT60A4101	SOFTWARE ENGINEERING METHODS	5 ECTS cr
	Software Engineering Methods, Ohjelmistotuotannon menetelmät	
Year and Period	B.Sc. (Tech.) 3, Period 1-2	
Teacher(s)	Professor, Ph.D. Kari Smolander	
Aims	The student will be able to participate to the analysis and design of software and information systems. The student will understand the problems in modern system and software work and the principles in their planning, analysis, and design. The student will be able to use the UML language in analysis and design.	
Content	Features of modern software development, requirements analysis and modeling, UML use cases, class diagrams, dynamic modeling, state diagrams, architecture design, the importance of methods and processes in software and systems development.	
Modes of Study	Lectures 14 h, exercises 14 h, exercise preparation 7 h, weekly self-study 7 h, 1st period. Lectures 14 h, exercises 14 h exercise preparation 7 h, weekly self-study 7 h, practical assignment 28 h, 2nd period.	

Evaluation	Preparing for exam 15 h. Exam 3 h.
Study materials	Total amount 130 h. 0 - 5. Exam. The course project can raise the grade as informed in the lectures. Lecture slides, supplementary material, e.g. Booch, G., Rumbaugh, J., Jacobson, I.: The Unified Modeling Language User Guide, Addison-Wesley, 1999. Jacobson, I., Booch, G., Rumbaugh, J.: The Unified Software Development Process, Addison-Wesley, 1999. Fitzgerald, Russo, Stolterman: Information Systems Development - Methods in Action, McGraw-Hill, 2002. Other material announced during lectures.
Prerequisites	CT60A4001 Ohjelmistotuotanto.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

CT60A5000	E-BUSINESS TECHNOLOGIES	5 ECTS cr
	E-Business Technologies, E-Business -teknologiat	
	The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4	
Teacher(s)	Doctoral Student, M.Sc. (Tech.) Tero Pesonen Person in Charge: Professor, Ph.D. Kari Smolander	
Aims	The student understands the basics of e-business technologies and implementation and can use the acquired knowledge in further studies of the subject.	
Content	E-business basics, EDI/EDIFACT, interoperability, B2B e-business, e-commerce. Basics of XML, web services, service orientation, and enterprise application integration. E-business technologies and standards such as RosettaNet and ebXML.	
Modes of Study	Lectures and seminars 28 h, 3-4 periods. Project assignment, report and presentation 34 h. Weekly self study 14 h. Reading the literature 30 h. Preparing for the exam 20 h. Exam 4 h. Total amount 130 h.	
Evaluation	0 - 5, exam 60 %, course project 40 %.	
Study materials	To be announced at the lectures.	
Prerequisites	CT60A4101 Software Engineering Methods (mandatory).	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

CT60A7201	ARCHITECTURE IN SYSTEMS AND SOFTWARE DEVELOPMENT	7 ECTS cr
	Architecture in Systems and Software Development, Arkkitehtuuri järjestelmien ja ohjelmistojen kehityksessä	
	The maximum number of participants is limited to 50 students.	
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 design. Architecture documentation. Architectural styles and patterns. Suitable also for postgraduate studies.	

Modes of Study	Lectures, lecture exercises and presentations at lectures 21 h, weekly self-learning 7 h, 3rd period. Lectures, lecture exercises and presentations at lectures 21 h, weekly self-learning 7 h, 4th period. Practical assignment and presentation 60 h. Self-study 63 h. Exam 3 h. Total amount 182 h.
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	Literature package given at the course. CT60A4101 Software Engineering Methods or equivalent.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

CT60A7302	SOFTWARE QUALITY, PROCESSES, AND ORGANIZATIONS	7 ECTS cr
	Software Quality, Processes, and Organizations, Ohjelmistojen laatu, prosessit ja organisaatiot	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Associate Professor, 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, exercises 14 h, assignments, self-study 14 h, team project 33 h, personal article review 10 h, 1. period. Lectures 14 h, exercises 14 h, assignments, self-study 14 h, team project 42 h, 2. Period. Preparation for exam 10 h, exam 3 h. Total amount 182 h.	
Evaluation	Blackboard is used in this course. 0 - 5. Exam 50 %, assignments 50 %.	
Study materials	Robillard, Kruchten, and d'Astous: Software Engineering Process with the UPEDU, Addison-Wesley, 2002.	
Prerequisites	CT10A9500 Research Methods. CT60A4101 Software Engineering Methods or equivalent.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

CT60A7400	FUNDAMENTALS OF INFORMATION SYSTEMS	7 ECTS cr
	Fundamentals of Information Systems	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Teacher(s)	Associate Professor, D.Sc. (Tech.) Erja Mustonen-Ollila	
Aims	In order to complete the course the student should be able to: Demonstrate a	

<p>Content</p> <p>Modes of Study</p> <p>Evaluation</p> <p>Study materials</p> <p>Prerequisites</p> <p>Further Information</p>	<p>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 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 of 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 for the postgraduate studies.</p> <p>Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, 2nd period. Two practical assignments 72 h, scientific home work exercises 50 h, 1st-2nd period. Preparation to the exam 15 h, exam 3 h. Total amount 182 h.</p> <p>0 - 5. Exam 50 %, two practical assignments 50 %. 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> <p>CT60A4001 Ohjelmistotuotanto</p> <p>This course has 1-5 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi</p>
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<p>CT60A7500</p>	<p>OBJECT-ORIENTED PROGRAMMING TECHNIQUES 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>Object-Oriented Programming Techniques, Olio-ohjelmoinnin menetelmät</p> <p>M.Sc. (Tech.) 1, Period 1-2 Professor, Ph.D. Kari Smolander</p> <p>The student understands advanced concepts and techniques of object-oriented programming, especially design patterns, and can apply these techniques in solving practical programming tasks.</p> <p>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.</p> <p>Lectures 14 h, exercises 14 h, exercise preparation 7 h, self-study 7 h, 1st period. Lectures 14 h, exercises 14 h, exercise preparation 7 h, self-study 7 h, 2nd</p>

130 Information Technology

Evaluation	period. Three practical assignments 27 h. Preparing for the exam 16 h, exam 3 h. Total amount 130 h. 0 - 5. Exam 60 %, exercises and practical assignment 40 %.
Study materials	Lecture notes. Eckel, B.: Thinking in Java, Prentice Hall. Gamma, E. et al.: Design Patterns, Addison-Wesley. Freeman, Freeman, Sierra & Bates: Head First Design Patterns, O'Reilly (2004 or newer).
Prerequisites	CT60A2410 Olio-ohjelmointi (Object-Oriented Programming) or equivalent.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

5.5. Master's Degree Programme in Industrial Management

International Master's Degree Programme - Global Management of Innovation and Technology

The new university level Master's Degree Programme in Industrial Management – Global Management of Innovation and Technology – offers a wide variety of perspectives into the management of innovation and technology in an international environment that is based on the combination of business, engineering and management.

The programme starts annually and lasts two years. The programme course package is worth approximately 90 ECTS credits, and at the end of their studies, students write a Master's thesis counted as an additional 30 ECTS credits. The programme is in total worth 120 ECTS credits, leading to a Master of Science in Technology degree.

Aims of the Master's Degree Programme and Learning Outcomes

LUT Industrial Management educates knowledgeable, business oriented students devoted to their own special subjects of technology and management for the service of industrial companies, and commercial and public organisations. The graduates from Industrial Management have a good understanding of technology, wide business knowledge, and a strong competence in the management and development tasks of a company. They have an ability to work in an international context, and act in a responsible and ethical way. They can and will further develop and enhance their own competencies.

After completing the degree, the graduate can

- create and analyse strategies within an international context relating to products, services and technologies
- practice and manage strategies of decision making, frameworks and tools in a global networks and markets
- analyse processes and structures of organisations and their development issues
- practice, plan and manage the build-up of product families, product systems, and product platforms for tangible and intangible goods using widely different management methods in companies and networks
- plan and manage international business
- apply theories, methods and tools of decision making and analysis to practical management activities.

Professional Scope of the Master's Degree Programme

International studies combined with engineering and business management skills and a multi-cultural study environment provide graduates with interesting and challenging career prospects. Global customer-supplier relationships and business networks demand talented young professionals in management of innovations and technologies, industrial marketing, management of sales, supply chain management and technology sourcing. Master of Science graduates with an engineering and management background and a strong ability and will to continue learning after graduation will have many career opportunities at the executive level of management as well as in global technology and business.

Graduates from the Department of Industrial Management have been employed e.g. as export managers, key account managers, logistics managers, controllers, analysts, business application specialists, operative purchasers, technology innovation managers etc. The studies also give graduates a firm basis for doctoral studies in the field of industrial management.

Field of Specialisation

The following field of specialisation is available as a major subject at Lappeenranta University of Technology at the department of Industrial Management: Global Management of Innovation and Technology. Efforts will be made to offer all students the opportunity to prepare their final Master's thesis for practical purposes in companies. In this way, students will have a chance to find solutions to practical problems that companies face. Besides the specific obligatory or elective courses offered in the degree programme, all other courses arranged at the university in English are available for the students, subject to practical limitations such as group size, teaching methods, schedules, etc.

The major subject allows focusing on a range of areas for the Master's thesis phase. Students may prepare their final thesis on topics including industrial marketing and international business, innovation and technology management, product and service development in networked company structures, methods and tools for decision making in product development and technology management, managing ramp-ups and innovative product launches in the market place, supply-demand networks, and service management. As a rule, all lecturing professors at the department are available for supervising theses. The topics may vary depending on the needs of the companies.

Complementary Studies

Students with a degree from a Finnish University of Applied Sciences or Polytechnics or equivalent will have to study complementary studies (25 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 134. Further information: Study Secretary Suvi Tiainen, room 4430, phone +358 40 502 2196, suvi.tiainen at lut.fi.

Global Management of Innovation and Technology

The Degree Structure of the Programme

Master of Science 120 ECTS cr

	<i>ECTS cr</i>
General studies	11
Major subject	70
Minor subject	22
Elective studies	17
<i>Total</i>	<i>120</i>

General Studies

<i>Obligatory studies (11 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CS10A0861	Introduction to Research Methods	M.Sc. (Tech.) 1	2	5
FV11A8900	Academic Writing in English	M.Sc. (Tech.) 1	1-2, 3, 3-4, 5	4
FV18A9101	Finnish 1	M.Sc. (Tech.) 1	1, 3	2

Major Subject Global Management of Innovation and Technology 70 ECTS cr

Major Subject 70 ECTS cr

<i>Obligatory studies (60 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CS10A0151	Business Relationships and Networks	M.Sc. (Tech.) 1	3-4	5
CS10A0550	International Business Methods	M.Sc. (Tech.) 1	1-2	7
CS30A1001	Product and Technology Strategy: Advanced Course in Innovation Management	M.Sc. (Tech.) 1	1-3	7
CS30A1051	Methods of Technology Management	M.Sc. (Tech.) 2	3	6
CS34A0500	Technology Commercialization and Corporate Venturing	M.Sc. (Tech.) 2	4 int.	5
CS90A0060	Master's Thesis	M.Sc. (Tech.) 2	1-4	30

<i>Elective studies min. 10 ECTS cr</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CS10A0651	Management of Innovations in Russia	M.Sc. (Tech.) 1	4	5
CS30A1361	Creativity in Innovation Processes	M.Sc. (Tech.) 1	4 int.	5
CS30A1551	System Dynamics and Industrial Management	M.Sc. (Tech.) 1-2	1-2 int.	5
CS30A1670	Service Innovation and Management	M.Sc. (Tech.) 2	1-2	5
CS34A0400	Strategic Entrepreneurship in Age of Uncertainty	M.Sc. (Tech.) 2	1	5

Minor Subject Business Technology 22 ECTS cr

Minor: Business Technology

<i>Obligatory studies (min 22 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
CS20A6060	Introduction to Logistics	3	5
CS35A0151	Product Lifecycle Management	4	7
CT60A4101	Software Engineering Methods	1-2	5
CT60A5000	E-Business Technologies	3-4	5

Elective Studies 17 ECTS cr

Elective studies are needed to attain the full 120 ECTS credits. It is recommended to choose the elective studies among the courses that are listed under major subject. However, elective courses can include any courses offered by LUT if the required prerequisites are completed.

Complementary Studies

Students with a degree from a Finnish University of Applied Sciences or Polytechnics or equivalent will have to study complementary studies (23 ECTS cr) which are not included in the Master's degree.

Complementary studies

<i>Obligatory studies (23 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BM20AMatB	Matematiikka B1 - B3	B.Sc. (Tech.) 1	3-4	8
CS10A0102	Teollisen markkinoinnin johtaminen	B.Sc. (Tech.) 3	3-4	5
CS10A0201	Markkinointitutkimus	B.Sc. (Tech.) 3	1-2	5
CS10A0260	Managing International Business	B.Sc. (Tech.) 3	2	5

5.6 Master's Degree Programme in Industrial Management – Global Management of Innovation and Technology

Joint Master's Degree LUT – Russian home university

Joint Master's Degree Programme is a double degree programme between LUT and partner universities. The students will study one year at their home university and then come to LUT for second year to specialize in Global Management of Innovation and Technology. Student is expected to do Master's thesis according to LUT practices. Please, see page 283.

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

Please note that if the Bachelor's degree is from the field of economics / business, the degree from the Industrial Management has to include the minor Business Technology.

The Degree Structure

Master of Science 120 ECTS cr

	<i>ECTS cr</i>
General studies	10
Major subject	70
Minor subject	20
Elective studies	20
<i>Total</i>	<i>120</i>

Compensation from the partner university's studies to LUT degree (altogether max. 50 ECTS credits) is included followingly:

General studies 10 ECTS credits, minor subject 20 ECTS credits and elective studies 20 ECTS credits.

Major Subject Global Management of Innovation and Technology 70 ECTS cr

Major Subject 70 ECTS cr

<i>Obligatory Studies (65 op)</i>		<i>vsk</i>	<i>per.</i>	<i>op</i>
CS10A0151	Business Relationships and Networks	DI 1	3-4	5
CS10A0550	International Business Methods	DI 1	1-2	7
CS10A0861	Introduction to Research Methods	DI 1	2	5
CS30A1001	Product and Technology Strategy: Advanced Course in Innovation Management	DI 1	1-3	7
CS30A1051	Methods of Technology Management	DI 2	3	6
CS34A0500	Technology Commercialization and Corporate Venturing	DI 2	4 int.	5
CS90A0060	Master's Thesis	DI 2	1-4	30

<i>Elective studies min. 10 ECTS cr</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
CS10A0651	Management of Innovations in Russia	M.Sc. (Tech.) 1	4	5
CS30A1361	Creativity in Innovation Processes	M.Sc. (Tech.) 1	4 int.	5
CS30A1551	System Dynamics and Industrial Management	M.Sc. (Tech.) 1-2	1-2 int.	5
CS30A1670	Service Innovation and Management	M.Sc. (Tech.) 2	1-2	5

136 Industrial Management

CS34A0400	Strategic Entrepreneurship in Age of Uncertainty	M.Sc. (Tech.)	2	1	5
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Please note that if the Bachelor's degree is from the field of economics / business, the degree from the Industrial Management has to include the minor Business Technology (please see page 277).

5.6. Courses in English in Industrial Management

		<i>ECTS cr</i>
CS10A0151	Business Relationships and Networks	5
CS10A0260	Managing International Business	5
CS10A0550	International Business Methods	7
CS10A0600	Doing Business in Transitional Economies	7
CS10A0651	Management of Innovations in Russia	5
CS10A0751	Enterprises and Competition in Russia	6
CS10A0800	The Basics of Doing Business in Russia	5
CS10A0852	European Union – Competitiveness and Enlargement	5
CS10A0861	Introduction to Research Methods	5
CS20A6060	Introduction to Logistics	5
CS30A1001	Product and Technology Strategy: Advanced Course in Innovation Management	7
CS30A1051	Methods of Technology Management	6
CS30A1361	Creativity in Innovation Processes	5
CS30A1500	Transportation Systems	5
CS30A1551	System Dynamics and Industrial Management	5
CS30A1651	Process and Product Innovations	10
CS30A1660	Open Innovation	5
CS30A1670	Service Innovation and Management	5
CS30A7000	Technology Management in Japan	3
CS34A0400	Strategic Entrepreneurship in Age of Uncertainty	5
CS34A0500	Technology Commercialization and Corporate Venturing	5
CS35A0151	Product Lifecycle Management	7
CS90A0060	Master's Thesis	30
CT60A4101	Software Engineering Methods	5
CT60A5000	E-Business Technologies	5

CS10A0151	BUSINESS RELATIONSHIPS AND NETWORKS 5 ECTS cr
	Liiketoimintasuhteet ja -verkostot
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Teacher(s)	Professor, D.Sc. (Tech.) Risto Salminen Docent, D.Sc. (Econ. & Bus. Adm.) Henriikki Tikkanen Professor, D.Sc. (Tech.) Anne Jalkala Part-time Untenured Teacher, D.Sc. (Tech.) Juha Haimala Doctoral Student, M.Sc. (Tech.) Olli Pekkarinen Visiting lecturers.
Aims	Person in Charge: Professor, D.Sc. (Tech.) Risto Salminen Student 1. understands the premises of relationship and network theories in industrial marketing 2. knows the principles and key concepts of relationship marketing 3. is able to analyze different phases of a customer relationship and manage and utilize a company's customer portfolio as a strategic resource 4. understands the characteristics and challenges in project marketing and solution business.
Content	Relationship and network theory in industrial marketing. Theoretical premises and characteristics of industrial marketing. Underlying theories and key concepts of relationship marketing. Different phases of customer relationships and customer portfolio management. Network theory and value networks. Principles and characteristics of project marketing and solution business. Practical illustrations related to managing business relationships.
Modes of Study	Lectures 8 h, 3rd period. Lectures 20 h, seminar 4 h, seminar work 10 h, learning diary 20 h, preparation for the exam and the exam 70 h, 4th period. Total 132 h. Blackboard is used in this course.
Evaluation	0-5, exam 65%, learning diary 35%. Additional points for attending visiting lectures.
Study materials	Ford, David - Berthon, Pierre et al.: The Business Marketing Course - Managing in Complex Networks. John Wiley & Sons, Ltd., IMP Group, 2002. Cova, Bernard - Ghauri, Pervez - Salle, Robert: Project Marketing – Beyond Competitive Bidding. John Wiley & Sons, Ltd, 2002 Anderson James C., Narus James A. and Narayandas Das: Business Market Management. Pearson Prentice Hall, New Jersey, 2009, 3rd Edition. Book chapters will be announced during the course. Lecture Materials.
Prerequisites	CS10A0001 Markkinoinnin peruskurssi
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.
CS10A0260	MANAGING INTERNATIONAL BUSINESS 5 ECTS cr
	Managing International Business
	The amount of participants may be limited. In this case the priority would be given to the students of Industrial Management.
Year and Period	B.Sc. (Tech.) 3, Period 2
Teacher(s)	Professor, D.Sc. (Tech.) Anne Jalkala Lecturer, M.Sc. (Econ. & Bus. Adm.) Daria Podmetina Person in Charge: Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student 1. recognizes the different entry modes and is able to describe the advantages and disadvantages between the different operation methods 2. is able to describe the most well known internationalization theories and evaluate the international operations of enterprises based on these theories 3. recognizes the characteristics of international relationships and understands the key practices of global account management 4. knows the principles of building a global marketing strategy and the factors affecting it.

Content	Entry modes in international business. Internationalization theories. Multinational Enterprises in global business. Marketing strategies. International relationships and business networks. Global account management.
Modes of Study	Lectures 21 h, written report 40 h, course literature 40 h, self study and exam preparation 30 h. Total 131 h.
Evaluation	0 - 5, exam 65%, written report 35%
Study materials	Hollensen, S., 2004, Global Marketing: A Decision-oriented approach, Harlow : FT Prentice Hall.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

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	
Aims	Student is able to 1. distinguish and evaluate the advantages and disadvantages of different entry modes 2. evaluate risks and opportunities in the global markets and justify the choice of entry method for different markets.	
Content	Various trade theories and the usefulness of them in practice. Main features of international trading and business relations since the Second World War. Markets and methods to evaluate them. Modes of international operations; special attention will be paid to exporting. Contractual arrangements and foreign direct investment (FDI). Theoretical approaches which explain international factor mobility. Different currency regimes. Trade agreements between nations. Risks in international business. International financial markets. Cultural factors in international business.	
Modes of Study	Lectures 42 h, exercises 14 h, written assignments 60 h, written report 20 h, course literature 25 h, self study and exam preparation 25 h. There are two exercise groups per week for this course. Total 186 h. Blackboard is used in this course.	
Evaluation	0-5, examination 50 %, exercises 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	CS10A0260 Managing International Business	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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	
Aims	Student 1. knows the special economic and business features and development of the emerging markets 2. can evaluate and analyze the risks and opportunities for investment, and choose the right modes of operations in TEs.	
Content	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. 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	<p>Lecture handouts.</p> <p>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.</p> <p>Tiusanen Tauno, Karhu Anna: Twenty Years of Post-Communist Transition in Europe, Northern Dimension Research Centre, Publication n:o 56, Lappeenranta University of Technology 2009.</p> <p>Tiusanen Tauno: Business Climate in Transitional Economies, Northern Dimension Research Centre, Publication n:o 48, Lappeenranta University of Technology 2008.</p> <p>Tiusanen Tauno: Development of rouble exchange rate in Russia, Northern Dimension Research Centre, Publication n:o 45, Lappeenranta University of Technology 2007.</p> <p>Tiusanen, Tauno: Romania and Bulgaria - Two New EU Members, Northern Dimension Research Centre, Publication n:o 44, Lappeenranta University of Technology 2007.</p> <p>Tiusanen Tauno, Karhu Anna: Twenty Years of Post-Communist Transition in Europe, Northern Dimension Research Centre, Publication n:o 56, Lappeenranta University of Technology 2009.</p>
Prerequisites	CS10A0550 International Business Methods.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

CS10A0651	MANAGEMENT OF INNOVATIONS IN RUSSIA 5 ECTS cr
	Management of Innovations in Russia
Year and Period	M.Sc. (Tech.) 1, Period 4
Teacher(s)	Lecturer, M.Sc. (Econ. & Bus. Adm.) Daria Podmetina Lecturer, M.Sc. (Econ. & Bus. Adm.) Irina Savitskaya Person in Charge: Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student knows 1. how to apply theories of national/regional innovation systems 2. how to analyze the interaction between main players of the innovation system (universities and research organizations, enterprises, government and industries) 3. how innovation process is managed in Russia 4. how global environment and international collaboration influence the innovation management process 5. how study the innovativeness of the enterprises 6. aspects of open innovations.
Content	National Innovation System (NIS) in Russia. Models, main players, role of government, innovation policy, role of universities and research institutions, regional diversity of innovations (regional innovation system RIS), science parks and innovation centers. Innovative industries in Russia, high-tech and low-tech industries. International cooperation and innovations. Role of FDIs, spillovers, exports. Innovations as the source of competitive advantage. Key issues of technology and innovation management in Russia. Aspects of open innovations, internal R&D, technology transfer and business model innovations. Suitable also for postgraduate studies.
Modes of Study	Lectures 14 h, written report 45 h, course literature 45 h, self study and exam preparation 30 h. Total 134 h.
Evaluation	0-5, exam 60 %, written report 40%
Study materials	<p>OECD (2005). Fostering Public-Private Partnership for innovation in Russia. OECD. ISBN 92-64-00965-5.</p> <p>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.</p> <p>Gurkov, I. (2004) Business Innovation in Russian Industry, Post-Communist Economies, Vol. 16, No. 4, pp. 423-438</p> <p>Torkkeli, M., Vaatanen, J , Podmetina, D., Yla-Kojola, A-M.,. (2009) Knowledge absorption in an emerging economy – the role of foreign investments and trade flows in Russia, International Journal of Business Excellence, Vol. 2, No.3/4 pp. 269 – 284</p>

Prerequisites	Desai, R.M., Goldberg, I, Enhancing Russia's competitiveness and innovative capacity, The World Bank Additional material will be announced at the lectures. CS10A0800 The Basics of Doing Business in Russia, exceptions can be granted for special reasons. 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.
CS10A0751	<i>ENTERPRISES AND COMPETITION IN RUSSIA 6 ECTS cr</i>
Year and Period	M.Sc. (Tech.) 1, Period 3
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student is able to 1. explain the theory of transition from centrally planned economy (CPE) to market economy 2. assess competitiveness of industrial sectors and enterprises 3. evaluate the impact of foreign direct investment on the development of transitional economy 4. explain the methods of increasing competitiveness and productivity on national, industrial and enterprise level.
Content	Privatization process and deregulation of the economy. Russian enterprise structures and emergence of new enterprises. Natural resources and consumer markets. Russia's competitiveness and foreign direct investment development. Role of government in transition process.
Modes of Study	Lectures 28 h, seminar work and presentation 50 h, course literature 45 h, self study and exam preparation 30 h. Total 153 h.
Evaluation	0-5, exam 60 %, written report 20%, presentation 20%
Study materials	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. 185 p. Additional material will be announced on lectures.
Prerequisites	CS10A0800 The Basics of Doing Business in Russia, exceptions can be granted for special reasons. 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.
CS10A0800	<i>THE BASICS OF DOING BUSINESS IN RUSSIA 5 ECTS cr</i>
	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	Student is able to 1. define the special characteristics of Russian business environment 2. explain the transition process from communism to market economy 3. distinguish Russian markets and society from the world economy 4. produce reliable information about Russia, its economy, society and investment opportunities 5. recognize Russia's competitive advantages and disadvantages.
Content	Transition of Russian society and business environment. Living standard analysis. Industrial sectors and foreign direct investments. Russia's competitiveness. Economic and political integration with the world economy.
Modes of Study	Lectures 21 h, seminar work and presentation 45 h, course literature 30 h, self study and exam preparation 30 h. Total 126 h.
Evaluation	0-5, exam 60 %, written report 20%, presentation 20%
Study materials	Tiusanen, T.: Russia and Foreign Direct Investment. Northern Dimension Research Centre, Publication n:o 52, Lappeenranta University of Technology 2008. Tiusanen, T.: Russia in the Global Economy. Northern Dimension Research Centre, Publication n:o 49, Lappeenranta University of Technology 2008. Lecture materials. 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.
CS10A0852	EUROPEAN UNION – COMPETITIVENESS AND 5 ECTS cr ENLARGEMENT
	European Union – Competitiveness and Enlargement
Year and Period	M.Sc. (Tech.) 1, Period 4
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student is able to 1. assess the competitiveness of EU in global economy 2. explain the process of European Union enlargement and it's influence on the competitiveness of EU 3. identify the factors affecting competitiveness and analyze the state and development of a country according to these measures.
Content	European Union global competitiveness. Enlargement process and profiles of new EU members. Trade and investment flows. Country competitiveness research methodologies.
Modes of Study	Lectures 21 h, seminar work and presentation 40 h, course literature 35 h, self study and exam preparation 30 h. Total 126 h.
Evaluation	0-5, exam 60 %, presentation 40%
Study materials	UNCTAD, World Investment Report 2011, United Nations 2011. World Economic Forum, Global Competitiveness report 2011-2012. WEF 2011. Tiusanen, T., Karhu, A.: Twenty Years of Post-Communist Transition in Europe. Northern Dimension Research Centre, Publication n:o 56, Lappeenranta University of Technology 2009.
Prerequisites	Additional material will be announced on lectures. 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.
CS10A0861	INTRODUCTION TO RESEARCH METHODS 5 ECTS cr
	Introduction to Research Methods
Year and Period	M.Sc. (Tech.) 1, Period 2
Teacher(s)	Lecturer, M.Sc. (Econ. & Bus. Adm.) Daria Podmetina Lecturer, M.Sc. (Econ. & Bus. Adm.) Irina Savitskaya Person in Charge: Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student is able to 1. read and access empirical research literature 2. understand different research philosophies and approaches 3. formulate the research topic for Master Thesis 4. understand how to collect and analyze different type of data 5. estimate and interpret the results of the research 6. write the Master Thesis research proposal.
Content	Nature of research and research methods, Master Thesis research and structure, data collection, sampling, surveys, research design, qualitative research, quantitative research
Modes of Study	Lectures 14 h, research proposal and presentation 30 h, two written assignments 30 h, course literature 25 h, self study and exam preparation 25 h. Total 124 h.
Evaluation	0-5, exam 40 %, report and presentation 40%, written assignments and active participation during lectures 20%
Study materials	Course book and additional materials will be announced before the lectures.
Prerequisites	Course participation is targeted to students of Global Innovation and Technology Management M.Sc. program. Participation of other students can be negotiated with the professor.

CS20A6060	INTRODUCTION TO LOGISTICS	5 ECTS cr
	Introduction to Logistics, Johdatus logistiikkaan	
	Course can not be used in same degree as CS20A0000 Toimitusketjut ja logistiikka	
Year and Period	B.Sc. (Tech.) 1, Period 3	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Tech.) Juha Saranen	
Aims	Student knows the role of logistics, importance in industry, key concepts, different activities of logistics and current trends.	
Content	Logistics and supply chains, capacity planning, global logistics, logistics strategy, integration and forecasting, transportation and facility location, inventory management and warehousing, performance measurement and risk.	
Modes of Study	Lectures 21 h, 3. period, individual reading, preparation for the exam and exam 110 h, 3. period. Total 131 h.	
Evaluation	Scale 0-5, examination 100 %	
Study materials	Waters, D.: Supply Chain Management: An Introduction to Logistics, Palgrave Macmillan, 2009. Additional journal articles.	
CS30A1001	PRODUCT AND TECHNOLOGY STRATEGY: ADVANCED COURSE IN INNOVATION MANAGEMENT	7 ECTS cr
	Product and Technology Strategy: Advanced Course in Innovation Management, Tuote- ja teknologiastrategia: Innovaatiojohtamisen jatkokurssi	
Year and Period	M.Sc. (Tech.) 1, Period 1-3	
Teacher(s)	Professor, D.Sc. (Tech.) Tuomo Kässi Assistant, N. N.	
Aims	Student can 1. analyze technology strategy of a company 2. apply different tools and frameworks of technology strategy for comparisons, categorizations, and judgment 3. make conclusions, develop and plan alternative progress routes for managing technology, innovations and product portfolios 4. produce, propose, and manage the build-up of product families, product systems and product platforms in tangible products and services 5. build up company networks and develop solutions for the issues relating to them.	
Content	Core material: Integrating technology and strategy. Managing innovation. The process of innovation management. Different theories of R&D. Assessment of different management strategic schools from the viewpoint of technology management. Dynamic capability. Innovation systems. Learning from markets and alliances. A company's internal venture operations. Managing and creating innovative organisations. Additional material: Product systems. Modulation and standardisation. Product platforms. Special material: Connecting business know-how to technology management. Suitable also for postgraduate studies.	
Modes of Study	Lectures in 1. period 21 h, case and other exercises in 1. period 6 h; lectures in 2. period 15 h, case and other exercises 4 h; seminars in 3. period 12 h. Total work load of the course 184 h. Exam after the course. Blackboard is used in this course.	
Evaluation	1-5 for the exam with weight 60 %, 1 – 5 for the seminar with weight 40 %, plus bonus for active participation in exercises 0 – 0,5.	
Study materials	Lecture and exercise material. Tidd, Joe & Bessant, John & Pavitt, Keith: Managing Innovation: Integrating Technological, Market and Organizational Change. John Wiley & Sons, England, 2001 or newer.	
Prerequisites	Recommended CS30A0951 Innovaatio- ja teknologiajohtamisen peruskurssi, CS30A1151 Strateginen johtaminen yrityksessä, CS30A0301 Yritysuunnittelu.	

144 Industrial Management

Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi
CS30A1051	METHODS OF TECHNOLOGY MANAGEMENT 6 ECTS cr
	Methods of Technology Management, Teknologian johtamisen menetelmät
Year and Period	M.Sc. (Tech.) 2, Period 3
Teacher(s)	Professor, D.Sc. (Tech.) Markku Tuominen Associate Professor, D.Sc. (Tech.) Kalle Elfvingren Assistant, N. N.
Aims	Student 1. will understand technology management methods 2. can apply different technology management methods to practical problems 3. can analyse the results for better decisions.
Content	Customer need assessment tools, quality function management, technology roadmapping, delphi-analysis, scenario analysis, R&D-project selection. Suitable also for postgraduate studies.
Modes of Study	Lectures and small group activities 8 hours, laboratory exercises 10 hours. Examination (45 h), article summaries (25 h), laboratory exercises (60 h). Total hours 150.
Evaluation	0-5, examination 30%, article summaries 30 %, laboratory exercises 40 %
Study materials	Articles, lecture notes and other announced literature.
Prerequisites	Recommended: CS30A0951 Innovaatio- ja teknologiajohtamisen peruskurssi, CS30A1001 Product and Technology Strategy: Advanced Course in Innovation Management
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.
CS30A1361	CREATIVITY IN INNOVATION PROCESSES 5 ECTS cr
	Creativity in Innovation Processes, Luovuus innovaatioprosesseissa
	Max. 30 students admitted.
Year and Period	M.Sc. (Tech.) 1, Period 4 int.
Teacher(s)	Professor, D.Sc. (Tech.) Vesa Harmaakorpi Guest Lecturer, D.Sc. (Econ. & Bus. Adm.) Tapani Fransi Researcher, M.Sc. Anne Pässilä
Aims	Student 1. understands creativity and its components in innovation 2. recognizes people as creative actors 3. is able to understand collective creativity and creativity systems 4. can combine artistic and engineer creativity 5. understands principles of multi-actor innovation and creativity processes 6. develops following skills of his/hers: creative personality, creative thinking skills and methods, creative will and motivation, as well as skills to act as innovation promotor in open innovation processes.
Content	Must know: students will be able to use practical creativity methods and methods enhancing group dynamics. Further on, they will be able to avoid association obstacles and lock-ins in creative processes. Should know: enhancing intellectual gross-fertilization in innovation sessions.
Modes of Study	Intensive week 19, lectures 24 h, seminar work 46 h, preparation for exam and exam 50 h. Exam. Total 120 h.
Evaluation	0-5, exam 50%, assignment 50%.
Study materials	To be informed later.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

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	Student 1. understands the application of different transportation modes in transportation logistics area, particularly in Eurasia 2. knows the most suitable international routes and their performance 3. knows organizational and technology development in transportation logistics, and their application and relationship on the overall performance 4. has a knowledge from environmental issues of transportation logistics - especially from the use of railways, intermodality, and containers 5. understands the environmental emissions caused by transportation systems, and the usage of dry ports for the reduction of these emissions.	
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, exercises 12 h; exercises conducted as a whole at the class room hours, but exam requires 104 hours from student in terms of reading course literature and getting familiar with other material. Total 130 h. Course webpage could be accessed through following link: http://kouvola.lut.fi/tutkimus/innorail/transportationsystem	
Evaluation	0-5, examination (70 %) ja accepted case exercises (30 %).	
Study materials	<p>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://info.tse.fi/julkaisut/vk/Ae6_2005.pdf</p> <p>2. Roso, Violeta (2009). The Dry Port Concept. Chalmers University of Technology. Doctoral Dissertation. ISBN 978-91-7385-338-5. Available at URL: https://document.chalmers.se/download?docid=281072365</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/!</p>	
Prerequisites	Recommended to have taken some logistical courses before, e.g. from topics of supply chain management and production control.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

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	Student 1. is able to construct different systems from the main research topics of industrial management, and identifies the dynamic interconnected nature (time dependent) of the performance of these systems 2. is able to use system dynamics simulation for quantifying the behavior of different systems by using simulation elements and levels 3. identifies the situations, where system dynamics based quantitative modelling is applicable, and possibly using these skills in thesis phase (M.Sc. and D.Sc.).
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, exercises and final seminar 14 h; Seminar work takes 52 hours of student time in a group (from one to three persons), and exam another 52 hours from student in terms of reading course literature and getting familiar with other material. Total 130 h. Course webpage could be accessed through following link: http://kouvola.lut.fi/tutkimus/innorail/systemdynamics
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.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.
CS30A1651	PROCESS AND PRODUCT INNOVATIONS 10 ECTS cr
	Process and Product Innovations , Prosessi- ja tuoteinnovaatiot
	Mainly for Finnish and international students from the departments of Chemical Technology, Mechanical Engineering, Electrical Engineering and Industrial 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)	Associate Professor, D.Sc. (Tech.) Ville Ojanen Associate Professor, D.Sc. (Tech.) Kimmo Kerkkänen Post-Doctoral Researcher, D.Sc. (Tech.) Lea Hannola Person in Charge: Professor, D.Sc. (Tech.) Ilkka Turunen
Aims	Upon completion of the module, the student will be able to explain typical methods, problems and their solution in the generation of innovations an novel technology, carry out interdisciplinary teamwork in internation-

Content	al environment and apply typical methods of process and product development. 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. Self study 212 h. Blackboard is used in this course.
Evaluation	0-5, project work 100%.
Study materials	Blackboard.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

CS30A1660	OPEN INNOVATION	5 ECTS cr
	Open Innovation	
Year and Period	M.Sc. (Tech.) 2, Period 3	
Teacher(s)	Researcher, M.Sc. (Tech.) Antero Kutvonen Visiting lecturers Person in Charge: Professor, D.Sc. (Tech.) Marko Torkkeli	
Aims	Student 1. can explain the concept of open innovation through both theory and examples (to e.g. a company executive) 2. identifies open innovation activities in real life companies and explain the motives for engaging in them and the mechanisms through which they create value for the company 3. can distinguish between modes of inbound and outbound open innovation 4. can analyze the relation between a company's strategic choices and application of open innovation 5. attains a basic familiarity with the scientific literature on the theme and the ability to view open innovation in the context of other innovation management theories.	
Content	Must know: The fundamental definitions and concept of open innovation. Modes of inbound open innovation, i.e. external acquisition of knowledge, and outbound open innovation, i.e. external exploitation of knowledge. Difference between closed and open innovation in managing technology. Identifying open innovation activities in real life firms. Monetary and strategic motives for engaging in open innovation. Should know: Process models of inbound and outbound open innovation. The role and importance of the individual process phases. The relation between corporate strategy, technology strategy and open innovation activities. Most common examples of firms used to explain open innovation. Varying topics from state-of-the-art open innovation research, depending on guest lecturer. Nice to know: Development of the open innovation concept on the basis of prior innovation management theories. Knowledge of the main scientific literature surrounding open innovation. Theoretical determinants of open innovation.	
Modes of Study	Lectures and guest speakers 28 h as intensive teaching. Small group assignments during lectures. Group exams (or substituting them with summaries of scientific articles, 24 h) on each intensive day, preparing for exams 24 h. Independent study 72 h. Total 124 h.	
Evaluation	Graded on a scale of 0-5. Continuous evaluation based on small group exams (80%) and participation in lectures (20%). Possibility to substitute group exams with literary work (summaries of scientific articles) in case of absence.	
Study materials	The course book and reading material will be announced at the first lecture.	
Prerequisites	Recommended:CS30A1001 Product and Technology Strategy: Advanced Course in Innovation Management, CS34A0500 Technology Commercialization and Corporate Venturing	

CS30A1670	SERVICE INNOVATION AND MANAGEMENT	5 ECTS cr
	Service Innovation and Management	
	Due to the teaching methods, the amount of participants may be limited. In this case the priority would be given to the students of Master's degree Programme in Industrial Management.	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	Associate Professor, D.Sc. (Tech.) Ville Ojanen	
Aims	Student can 1. recognize and categorize the variety of services and service firms in modern industrial environment as well as understand their influence in management of industrial innovations 2. identify the characteristics of services and evaluate the similarities, differences and links between services and physical products 3. define the dimensions of service innovations 4. explain the processes of new service development 5. summarize the main managerial challenges in service innovation management 6. select and apply the suitable frameworks, tools and methods, to overcome some typical real-world challenges in service innovation management 7. explain the significance, main principles and roles of value networks in service delivery and development.	
Content	Typologies of service firms. Characteristics of services. Product-service systems in manufacturing industry. Knowledge-intensive business services. New service development process: sources of service ideas, development of service strategies and culture, service design. Dimensions of service innovations. Productization of services. Supporting methods for service innovation management. Managerial challenges in service innovation management. Utilization of frameworks, methods and tools in service innovation management. Roles of different types of firms in service systems and networks. Value creation through services. Customer-centric service development.	
Modes of Study	Lectures 12 h, 1st period. Preparation for the lectures 4 h, 1st period. Writing case reports in groups 16 h, 1st period. Starting project work 12 h, 1st period. Lectures and exercises 8 h, 2nd period. Seminars 12 h, 2nd period. Writing project work 56 h, 2nd period. Altogether 120 h. Blackboard is used in this course.	
Evaluation	0-5, written reports and seminars 100 %	
Study materials	Lecture notes. Other material, books and articles announced in the beginning of the course.	
Prerequisites	Recommended: B.Sc on Industrial Engineering and Management, or equivalent knowledge	
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 an 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 	

Modes of Study	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 Lectures 18 h, learning diary 6 h/day (24 h in total), preparation for the exam (report) 30 h. Altogether 72 h.
Evaluation	Percentage of active participation and written assignment (active participation in classes 50% and written assignment 50%).
Study materials	Written material will be distributed during lectures.
Prerequisites	Basic knowledge of production management.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

CS34A0400	STRATEGIC ENTREPRENEURSHIP IN AGE OF 5 ECTS cr UNCERTAINTY
Year and Period	M.Sc. (Tech.) 2, Period 1
Teacher(s)	Professor, D.Sc. (Tech.) Marko Torkkeli
Aims	"Managing in a knowledge-based economy", "Managing by Core Competences", "Knowledge intensive firms", "Uncertainty and Change management". The latest buzz words or another passing managerial fad? Old wine in new bottles? Or perhaps, just perhaps, a fundamental means of survival and success for modern day corporations? Given the amount of effort that has been devoted to the topic by both academics and practitioners, it appears worth our while to take a deep and dispassionate look at the role of entrepreneurial thinking in sustained competitive advantage. The goal is to learn as you go and effectively convert assumptions to knowledge at a low cost. For example, via Stepping-Stone Options, "You start with small, exploratory forays into less challenging market niches and use the experiences gained there as steppingstones to build competencies in increasingly challenging and attractive market arenas that you discover as you go."
Content	Entrepreneurial thinking, uncertainty management, strategic entrepreneurship
Modes of Study	Lectures 28 h, 1. period. Journal article reading 50 h, 1. period. Seminar work writing 60 h, 1. period. Total 138 h.
Evaluation	0-5
Study materials	Lectures. McGrath Rita and MacMillan Ian, (2000). The Entrepreneurial Mindset. Harvard Business School Pr.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

CS34A0500	TECHNOLOGY COMMERCIALIZATION AND 5 ECTS cr CORPORATE VENTURING
	Technology Commercialization and Corporate Venturing, Teknologian kaupallistaminen
Year and Period	M.Sc. (Tech.) 2, Period 4 int.
Teacher(s)	Professor, D.Sc. (Tech.) Marko Torkkeli Visiting lecturers
Aims	Student understands the characteristics of technology commercialization and high growth technology ventures.
Content	This course examines issues related technology commercialization, corporate venturing, and ways to profitably exploit business opportunities. Business models. Suitable also for postgraduate studies.

150 Industrial Management

Modes of Study	Lectures 28 h, 4. period. Journal article reading 50 h, 4. period. Seminar work writing 60 h, 4. period. Total 138 h.
Evaluation	0-5
Study materials	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.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

CS35A0151	PRODUCT LIFECYCLE MANAGEMENT	7 ECTS cr
	Product Lifecycle Management, Tuotetiedon hallinta	
Year and Period	M.Sc. (Tech.) 2, Period 4	
Teacher(s)	Lecturer, M.Sc. (Tech.) Jorma Papinniemi Doctoral Student, M.Sc. (Tech.) Kyllikki Taipale-Eräväla Visiting lecturers Person in Charge: Lecturer, M.Sc. (Tech.) Jorma Papinniemi	
Aims	Student can 1. define and explain the concepts of product data management and product life cycle management 2. recognize the company's product processes and understands their interaction with the company's overall operations 3. compare PLM-/PDM systems' characteristics, technical features and managerial functions and is able to see their role in product development and business.	
Content	Different views on the product processes of an enterprise. Lifecycle models of products and project business. Managing the use and changes of product related information at different stages of the product lifecycle. PLM systems and their functionalities: managing generic products, individual products, items and documents. Integrating a PLM system with other enterprise systems. PLM project and system implementation. Demos of PLM systems.	
Modes of Study	Lectures 21 h 4th period as intensive studies, project assignment 60 h 4th period, independent course task/reviewing other assignments 20 h 4th period, seminars 21 h 4th period as intensive studies, exam 60 h 4th period. Total 182 h. Blackboard is used in this course.	
Evaluation	0-5, exam 60 %, project assignment and seminar participation 40 %.	
Study materials	Journal articles. Sääksvuori-Immonen: Product Lifecycle Management, Springer 2008. Forza-Salvador: Product Information Management for Mass Customization, Palgrave Macmillan, 2007. (partly)	
Prerequisites	CS30A0951 Innovaatio- ja teknologiajohtamisen peruskurssi	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

CS90A0060	MASTER'S THESIS	30 ECTS cr
	Diplomityö	
Year and Period	M.Sc. (Tech.) 2, Period 1-4	
Teacher(s)	Professors of major subjects	
Aims	In their Master's thesis, students demonstrate their knowledge of a topic of scientific and societal importance in a specific professional area. The student must demonstrate the ability to carry out the project independently and following a plan. The thesis must be organised coherently, the presentation academic and the language revised.	
Content	The Master's thesis is the final project of the degree of Master of Science (Technology). Usually it involves a development project commissioned by a company and takes about six months. The work entails working on a develop-	

Modes of Study	ment project related to industrial management, preparing a report in the form of a thesis, and presenting the work in a seminar.
Evaluation	Development project and related report, presentation of the work in a seminar, maturity test (usually on the contents of the thesis).
Prerequisites	Scale 0-5, Master's thesis 100%. B.Sc. (Tech.) degree (not required of students admitted directly into a Master's programme), complementary studies (for students admitted directly into a Master's programme), major studies min. 15 ECTS credits.

CT60A4101	SOFTWARE ENGINEERING METHODS	5 ECTS cr
	Software Engineering Methods, Ohjelmistotuotannon menetelmät	
Year and Period	B.Sc. (Tech.) 3, Period 1-2	
Teacher(s)	Professor, Ph.D. Kari Smolander	
Aims	The student will be able to participate to the analysis and design of software and information systems. The student will understand the problems in modern system and software work and the principles in their planning, analysis, and design. The student will be able to use the UML language in analysis and design.	
Content	Features of modern software development, requirements analysis and modeling, UML use cases, class diagrams, dynamic modeling, state diagrams, architecture design, the importance of methods and processes in software and systems development.	
Modes of Study	Lectures 14 h, exercises 14 h, exercise preparation 7 h, weekly self-study 7 h, 1st period. Lectures 14 h, exercises 14 h exercise preparation 7 h, weekly self-study 7 h, practical assignment 28 h, 2nd period. Preparing for exam 15 h. Exam 3 h. Total amount 130 h.	
Evaluation	0 - 5. Exam. The course project can raise the grade as informed in the lectures.	
Study materials	Lecture slides, supplementary material, e.g. Booch, G., Rumbaugh, J., Jacobson, I.: The Unified Modeling Language User Guide, Addison-Wesley, 1999. Jacobson, I., Booch, G., Rumbaugh, J.: The Unified Software Development Process, Addison-Wesley, 1999. Fitzgerald, Russo, Stolterman: Information Systems Development - Methods in Action, McGraw-Hill, 2002. Other material announced during lectures.	
Prerequisites	CT60A4001 Ohjelmistotuotanto.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

CT60A5000	E-BUSINESS TECHNOLOGIES	5 ECTS cr
	E-Business Technologies, E-Business -teknologiat	
	The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4	
Teacher(s)	Doctoral Student, M.Sc. (Tech.) Tero Pesonen Person in Charge: Professor, Ph.D. Kari Smolander	
Aims	The student understands the basics of e-business technologies and implementation and can use the acquired knowledge in further studies of the subject.	
Content	E-business basics, EDI/EDIFACT, interoperability, B2B e-business, e-commerce. Basics of XML, web services, service orientation, and enterprise application integration. E-business technologies and standards such as RosettaNet and ebXML.	
Modes of Study	Lectures and seminars 28 h, 3-4 periods.	

152 Industrial Management

Evaluation	Project assignment, report and presentation 34 h.
Study materials	Weekly self study 14 h.
Prerequisites	Reading the literature 30 h.
Further Information	Preparing for the exam 20 h. Exam 4 h.
	Total amount 130 h.
	0 - 5, exam 60 %, course project 40 %.
	To be announced at the lectures.
	CT60A4101 Software Engineering Methods (mandatory).
	This course has 1-5 places for open university students. More information on the web site for open university instruction.

6. School of Business

6.1. MASTER'S DEGREE IN INTERNATIONAL TECHNOLOGY AND INNOVATION MANAGEMENT (MITIM)

The international Master's Degree in International Technology and Innovation Management gives students the required theoretical and practical competences in conducting strategic technology and innovation management in turbulent global environments and emerging markets. The programme corresponds to the strong demand for international professionals capable of working in contemporary dynamic Russian-EU-Finnish businesses.

The competencies in general and strategic management build the foundation of the degree, whereas the competencies related to international business environment develop the understanding of the global context. Building on both of these two competence areas, advanced competencies in technology and innovation management are developed as the capstone competencies.

After completing the program, students will be able to:

- *analyze managerial problems and make strategic decisions related to technology and innovation management in the context of international business*
- *demonstrate analytical business skills*
- *apply conceptual tools to concrete business challenges*
- *utilize intercultural competence*
- *conduct an independent scientific research project, report and present it professionally*
- *show a global and innovative mindset*

International exchange is recommended during M. Sc. (Econ. & Bus) 2 Fall semester to Russia or to Eastern European countries. The exchange studies should be included in elective studies. A Russian-related minor topic and Russian language studies are also recommended.

Master of Science in Economics and Business Administration

The Degree Structure

General Studies	6	ECTS cr
Core Studies	70	ECTS cr
Minor Studies	24-28	ECTS cr
Elective Studies	10-14	ECTS cr
Language	6	ECTS cr
<i>Credits</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

Core Studies (70 ECTS cr)

<i>All courses are obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A340A0050 Knowledge Management and Networks	M.Sc. (Econ. & Bus. Adm.)	1 2	6
A350A0100 Consulting Project at LUT	M.Sc. (Econ. & Bus. Adm.)	1 3-4	6
A350A0150 Corporate Strategy for Emerging Markets	M.Sc. (Econ. & Bus. Adm.)	1 3	6
A350A0300 Technology and Innovation Management	M.Sc. (Econ. & Bus. Adm.)	1 2	6
A350A0350 ¹ Strategic Management	M.Sc. (Econ. & Bus. Adm.)	1 1	6
A350A0400 Contemporary Issues in Technology and Innovation Management (kurssikuvaus tulee opinto-oppaaseen 2012-2013)	M.Sc. (Econ. & Bus. Adm.)	2	6
A390A0200 ¹ Kasvun strateginen johtaminen	M.Sc. (Econ. & Bus. Adm.)	1 4	6
MITIM-HAR4 Internship	M.Sc. (Econ. & Bus. Adm.)	2	4

154 Business Administration

A350A9100	Research Seminar for Master's Thesis (LUT) (kurssikuvaus tulee opinto-oppaaseen 2012-2013)	M.Sc. (Econ. & Bus. Adm.) 2	30
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¹⁾ Exchangeable

Recommended minor studies (24-28 ECTS cr)

Business and Technology in Russia 24 op

The following courses from *Business and Technology in Russia* minor studies are accepted in the MITIM program:

<i>Alternative Studies, select at least 24 ECTS cr</i>		<i>per.</i>	<i>ECTS cr</i>
A220A0150	International Finance and Emerging Markets	2	6
BJ40A0300	Management of Technical Information in Export of Processing Equipment to Russian Federation	4	5
BH60A2800	Energy and Environmental Challenges in Russia	3	5
CS10A0751	Enterprises and Competition in Russia	3	6
CS10A0800	The Basics of Doing Business in Russia	2	5
FV14A1200 ⁽¹⁾	Russian 1	1-2, 3-4	3
FV14A1400 ⁽¹⁾	Russian 2	1-2, 3-4	3
FV14A1801 ⁽¹⁾	Cases in Russian	3-4	3
FV14A4200 ⁽¹⁾	Nykyvenäjän kieltä ja maantuntemusta	1-2	3

¹⁾ Exchangeable

²⁾ Only one Russian language course can be included to the minor. Language courses are alternative to each other and should be selected according to the student's language skills.

Russia and Transitional Economies: Business Environment 28 ECTS cr

		<i>per.</i>	<i>ECTS cr</i>
CS10A0550	International Business Methods	1-2	7
CS10A0651	Management of Innovations in Russia	4	5
CS10A0751	Enterprises and Competition in Russia	3	6
CS10A0800	The Basics of Doing Business in Russia	2	5
CS10A0852 [*]	European Union – Competitiveness and Enlargement	4	5

^{*}Please note that the course can be included to the Master's degree only once.

General Studies (6 ECTS cr)

		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A350A0050	Business Research Methods	M.Sc. (Econ. & Bus. Adm.) 1	1-2	6

Choose from the list to fulfill the Master's Degree 120 ECTS cr

Elective Studies

<i>Electives from LUT School of Business</i>		<i>per.</i>	<i>ECTS cr</i>
A210A0050	Comparative International Accounting: Theory and Practice	1-2	6
A330A0000	Contemporary Issues in International Marketing		6
A330A0200	International Marketing of High Technology Products and Innovations	1	6
A330A0250	Internationalization of the Firm and Global Marketing	2	6
A350A0000	Business Process Management and Information Technologies	4	3
A350A0250	Multivariate and Econometric Analysis Methods	3-4	6
CS10A0852 [†]	European Union – Competitiveness and Enlargement	4	5

[†] Please note that the course can be included to the Master's degree only once

6.2. MASTER'S DEGREE PROGRAM (CBU) IN BUSINESS AND ADMINISTRATION INTERNATIONAL TECHNOLOGY AND INNOVATION MANAGEMENT (MITIM) Double Degree

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. Students admitted into the double degree program receive a degree certificate from both universities provided that they fulfill the requirements of both universities.

The Master's degree program titled as "International Technology and Innovation Management", takes two years, corresponds to the minimum of 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. Three semesters include obligatory lectures and exercises, as well as a summer internship and elective courses. The fourth semester is devoted to the Master's thesis. The language of tuition in the program is English.

NOTE: LUT MITIM students study 1st year of their studies at LUT and 2nd year of their studies at GSOM. LUT MITIM students follow the degree structure mentioned below during the 1st year of their studies (courses marked M.Sc. (Econ. & Bus. Adm.) 1 or 1/2). During the 2nd year of studies LUT MITIM students participate to courses offered by GSOM to fulfill their curriculum.

GSOM MITIM students study 1st year of their studies at GSOM and 2nd year of their studies at LUT. GSOM MITIM students follow the degree structure of GSOM during the 1st year of their studies. During the 2nd year of studies GSOM MITIM students participate to courses offered by LUT (courses marked M.Sc. (Econ. & Bus. Adm.) 2 or 1/2) to fulfill their curriculum.

Students will have to take complementary language studies of a minimum of 6 ECTS credits of one language (other than English). Russian language studies are recommended. These studies are not included in the Master's degree, but are an addition to it.

Master of Science in Economics and Business Administration

The Degree Structure

General Studies	9	ECTS cr
Core Studies	65	ECTS cr
Minor Studies	34	ECTS cr
Elective Studies	12	ECTS cr
<i>Credits</i>	<i>120 (min.)</i>	<i>ECTS cr</i>

Core Studies (65 ECTS cr)

<i>All courses are obligatory (65 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A340A0050 Knowledge Management and Networks	M.Sc. (Econ. & Bus. Adm.) 1/2	2	6
A350A0100 Consulting Project at LUT	M.Sc. (Econ. & Bus. Adm.) 1	3-4	6
A350A0150 Corporate Strategy for Emerging Markets	M.Sc. (Econ. & Bus. Adm.) 1	3	6
A350A0300 Technology and Innovation Management	M.Sc. (Econ. & Bus. Adm.) 1/2	2	6
A350A0350 Strategic Management	M.Sc. (Econ. & Bus. Adm.) 1	1	6
CS30A1670 Service Innovation and Management	M.Sc. (Econ. & Bus. Adm.) 2	1-2	5
A350A9000 Research Seminar for Master's Thesis	M.Sc. (Econ. & Bus. Adm.) 1/2	1-4	30

156 Business Administration

Business Administration in CBU

<i>All courses are obligatory (34 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A220A0250 Managerial Finance	M.Sc. (Econ. & Bus. Adm.)	1 3	6
A330A0100 International Business Strategies	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
A330A0300 Strategic Global Marketing Management	M.Sc. (Econ. & Bus. Adm.)	1 1	6
A350A0200 Introduction to Economics	M.Sc. (Econ. & Bus. Adm.)	1	6
A390A0450 Organization Theory	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
MITIM-HAR4 Internship	M.Sc. (Econ. & Bus. Adm.)	2	4

General Studies (9 ECTS cr)

<i>All courses are obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A350A0000 Business Process Management and Information Technologies	M.Sc. (Econ. & Bus. Adm.)	1 4	3
A350A0050 Business Research Methods	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6

<i>Electives from LUT School of Business</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A210A0050 Comparative International Accounting: Theory and Practice	M.Sc. (Econ. & Bus. Adm.)	1/2 1-2	6
A330A0000 Contemporary Issues in International Marketing	M.Sc. (Econ. & Bus. Adm.)	1/2	6
A330A0200 International Marketing of High Technology Products and Innovations	M.Sc. (Econ. & Bus. Adm.)	1/2 1	6
A330A0250 Internationalization of the Firm and Global Marketing	M.Sc. (Econ. & Bus. Adm.)	1/2 2	6
A350A0250 Multivariate and Econometric Analysis Methods	M.Sc. (Econ. & Bus. Adm.)	1/2 3-4	6
CS10A0852 European Union – Competitiveness and Enlargement	M.Sc. (Econ. & Bus. Adm.)	1/2 4	5

The Courses Offered in English

	<i>ECTS cr</i>
A210A0050 Comparative International Accounting: Theory and Practice	6
A220A0150 International Finance and Emerging Markets	6
A220A0250 Managerial Finance	6
A330A0000 Contemporary Issues in International Marketing	6
A330A0100 International Business Strategies	6
A330A0200 International Marketing of High Technology Products and Innovations	6
A330A0250 Internationalization of the Firm and Global Marketing	6
A330A0300 Strategic Global Marketing Management	6
A340A0050 Knowledge Management and Networks	6
A350A0000 Business Process Management and Information Technologies	3
A350A0050 Business Research Methods	6
A350A0100 Consulting Project at LUT	6
A350A0150 Corporate Strategy for Emerging Markets	6
A350A0200 Introduction to Economics	6
A350A0250 Multivariate and Econometric Analysis Methods	6
A350A0300 Technology and Innovation Management	6
A350A0350 Strategic Management	6
A350A9000 Research Seminar for Master's Thesis	30
A390A0450 Organization Theory	6
CS10A0852 European Union – Competitiveness and Enlargement	5
CS30A1670 Service Innovation and Management	5

A210A0050	COMPARATIVE INTERNATIONAL ACCOUNTING: THEORY AND PRACTICE	6 ECTS cr
	Comparative International Accounting: Theory and Practice	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed, N. N.	
Aims	At the end of the course a student is expected to be able to: -compare and analyze accounting practices and quality of accounting information in different parts of the world -assess the international harmonization of accounting standards -analyze the impact of different social, financial, legal and taxation systems on accounting -interpret the practical implications of international differences in accounting -develop the communication and social skills through working in multi-cultural groups for term paper and presentation	
Content	The course is focused on international differences in accounting practices and quality of reported information associated with various social, legal and taxation systems. The harmonization of accounting standards and the practical implications of differences in accounting systems.	
Modes of Study	Lectures: 24 h, period 1 Preparation for lectures and exam: 104 h, period 1-2 Term paper writing and presentation preparation: 28 h, period 1-2 Seminars: 4 h, period 2 Total workload: 160 h. Blackboard in use.	
Evaluation	Grade 0-5, evaluation on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both. Bonus points for active class participation.	
Study materials	1. Nobes and Parker: Comparative International Accounting, 2006 or later edition. 2. Handouts in the class and all additional material required by the lecturers.	
Prerequisites	Compulsory bachelor's level courses in accounting and finance.	
A220A0150	INTERNATIONAL FINANCE AND EMERGING MARKETS	6 ECTS cr
	International Finance and Emerging Markets	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem, visiting lecturers	
Aims	At the end of the course the student is expected to know: - how the theory of international trade and finance is formed; - the basic relations in international asset pricing; - the specifics in Russian financial markets: stock, bond, money and derivative markets; - the specifics in corporate governance, privatization and corporate finance in Russia; - the latest issues in empirical financial research on the Russian market; - the special characteristics of other emerging markets: BRIC countries, Frontier emerging markets, the Emerging Europe and the Middle East; - what are the different sources of risks involved in emerging markets;	

158 Business Administration

Content	- different episodes of financial crisis The course is designed to give advanced-level (Master) knowledge of International Finance and Emerging Markets. The course covers five different areas in International Finance and Emerging Markets: 1) international trade and finance, 2) international asset pricing, 3) multinational finance, 4) special characteristics of emerging financial markets, 5) different episodes of financial crisis.
Modes of Study	Lectures: 30 h, period 2 Preparation for lectures and exam: 94 h, period 2 term paper: 36 h, period 2 Total workload: 160 h Blackboard in use.
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and home assignments (20%). Students are required to achieve 50 percent of the maximum points in both.
Study materials	Bonus points for active class participation. 1. Eiteman, Stonehill, and Moffett: "Multinational Business Finance". Pearson International, 2007, 11th edition. Selected parts. 2. Research articles
Prerequisites	3. Handouts in class and all additional material required by the lecturer Compulsory bachelor's level courses in finance and economics.

A220A0250	MANAGERIAL FINANCE	6 ECTS cr
	Managerial Finance	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem	
Aims	At the end of the course, the student is expected to: - apply corporate finance theory in business strategies - compute and compare different techniques of valuing real assets; - evaluate investment decisions based on the riskiness of projects; - classify the impact of corporate taxes on asset valuation and financial decisions; - examine the affect of managerial incentives on financial decisions; - analyze the importance of risk management in corporate financial decisions.	
Content	The core contents of the course cover six different areas in corporate finance: 1) financial markets and financial instruments, 2) valuation of financial assets, 3) valuation of real assets, 4) capital structure of firms, 5) managerial Incentives, Information and corporate control in financial decisions, 6) risk management.	
Modes of Study	Lectures: 21 h, period 3 Preparation for lectures and exam: 105 h, period 3 Term paper writing: 34 h, period 3 Total workload: 160 h Blackboard in use.	
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both.	
Study materials	Bonus points for active class participation. 1. David Hiller, Mark Grinblatt and Sheridan Titman: Financial markets and corporate strategy – European edition 2007 (Text book) 2. Brealey Myers: Principles of corporate finance, seventh edition (additional readings)	
Prerequisites	3. Handouts in class and all additional material required by the lecturer Compulsory bachelor's level courses in finance and economics.	

A330A0000	CONTEMPORARY ISSUES IN INTERNATIONAL 6 ECTS cr MARKETING
	Contemporary Issues in International Marketing
	The course has intensive teaching by an international visiting professor, complemented with an article package and independent study.
Year and Period Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1 N. N.
Aims	Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo The learning outcomes of the course are the following: 1. To assess the contemporary concepts and issues ("hot topics") in international marketing. 2. To synthesize and evaluate contemporary international marketing phenomena. 3. To discuss and debate on special topic of international marketing (specified later) 4. To be able to collaborate in a cross-cultural teams.
Content	The specific content of this course will vary depending on the visiting international professor. However, the course covers chosen contemporary concepts and issues affecting international marketing today.
Modes of Study	30 hours of Intensive integrated lectures and exercises (assignments and cases) by the international guest lecturer 20 hours of preparation for exercises 30 hours of preparation for written exam 80 hours of individual independent study: reading the article package and writing of reflective essays Course total 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: Reflective essay (50 points) Written exam (30 points) Exercises (20 points)
Study materials	Material to be assigned in class.
Prerequisites	Basic knowledge of international marketing
A330A0100	INTERNATIONAL BUSINESS STRATEGIES 6 ECTS cr
	International Business Strategies
	The number of students attending the course may have to be limited based on a 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.
Year and Period Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2 Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen
Aims	The aim of the course is to familiarize 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. After completing the course the students should be able to: • analyse technology intensive international marketing environment, and to

	<p>generate and carry out properly justified international business strategies.</p> <ul style="list-style-type: none"> • decompose the corporate strategy into functional strategies (e.g. marketing or production strategy), and to coordinate and critically evaluate the implemented strategies, by interpreting key financial indicators of performance; • plan, communicate, and carry out a group research project applied to a firm in a simulation, • work in a multi-cultural team; • be able to interpret new information critically and systematically and be able to develop ideas and projects based on this information; • be able to apply knowledge gained from the course, in addition to that provided by additional reading, analysis and discussion, to the events, activities and/or strategies of an actual firm or organisation. • participate in discussion on topics of international business interest, and to stimulate and answer questions from a knowledgeable audience; <p>develop a mindset that fosters sustainability, and global, market and technology orientation in a global business environment</p> <p>Content The skills and application of critical inquiry into your reading, discussions, and situations and experiences that you encounter with regard to international business, both inside and outside the classroom setting. The international business planning process and its content especially related to international marketing. International and global business strategies. Strategic tools for analyzing the internal and external environment, for example resource and product positions. Organization of resources, capabilities and knowledge within a multinational corporation. Implementation methods of an international business strategy. International finance, international HRM, international production and sourcing strategies, corporate social responsibility. OLI paradigm, institutional theory, international technology strategy, real-life firm strategy examples (provided by a guest lecturer).</p> <p>Modes of Study 18 h of interactive lectures, 1st period. 10 h of interactive lectures, 2nd period. Group assignment/project work based on simulation exercises in international groups (incorporating online simulation and written group assignments: a strategic plan and a reflective report) 97 h Mid-term tutorial (each group independently with tutors) 1 h Preparation for lectures and exam 34 h Written exam.</p> <p>Evaluation Total course 160 h. Final grade 0-5. Evaluation 0-100 points: Active class participation Assignment(s): oral and written project work in groups, 70 points Exam, 30 points All assignments (including the exam) must be passed.</p> <p>Study materials Lasserre, P. (2007). Global Strategic Management. Peng, M.W. (2006). Global Strategy (or a newer 2nd edition). Assigned reading (collection of articles). Guide manual for the simulation.</p> <p>Prerequisites Slides from the lectures. AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Technology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing</p>
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A330A0200	INTERNATIONAL MARKETING OF HIGH TECHNOLOGY PRODUCTS AND INNOVATIONS	6 ECTS cr
	International Marketing of High Technology Products and Innovations	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, Professor, Ph.D Sanjit Sengupta	
Aims	After the course, student should be able to: 1. interpret and analyze external high technology environments (e.g. relating to competitive landscape, consumer behavior, markets) in global scale 2. distinguish the special characteristics of high technology marketing environment (like the type of innovation, market and technology uncertainties, network externalities) and evaluate marketing management strategies in such environments 3. apply and develop transferable intellectual skills (like theory application, problem solving, information acquisition, analytical, communications, social and intercultural competence).	
Content	Course aims to provide a deep understanding of the functions of marketing regarding challenges and opportunities in high technology products and markets; assist the participants to understand the virtue and limitations of traditional marketing thinking and tools in emergent high technology markets. Contingency model of high technology marketing, Special characteristics of technology intensive markets, How to apply marketing tools in high technology companies. Industry evolution, innovation typologies, entry strategies, technology maps, technology paradox in pricing, launch strategies, innovation adoption and diffusion.	
Modes of Study	Lectures, assignments, exam. In-class hours: 12 hours of lectures (2 h/week during 6 weeks) 20 hours of seminars (4h/week during 5 weeks) 3 hours of business case presentations Total in-class: 35 hours Out-class hours: 24 hours of exam preparation 5 hours for preparing for lectures 78 hours for doing assignments 5 hours for preparing presentation 13 hours for solving and presenting business case Total out-class: 125 hours Exam: 3 hours Total workload for student 160 h. Blackboard in use.	
Evaluation	Final grade 0-5. Evaluation 0-100 points: Exam (30 points) Assignments (groupwork) (50 points). NOTE: Peer evaluation of the group work may effect on the grade. Presentation (10 points) Business case (10 points). All assignments except the business case which is voluntary must be passed to acquire a final grade.	
Study materials	1. Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2010) Marketing of High-Technology Products and Innovations. Third Edition. Pearson Prentice Hall. 2. Assigned reading.	
Prerequisites	AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or	

A330A0250	INTERNATIONALIZATION OF THE FIRM AND GLOBAL MARKETING	6 ECTS cr
	Internationalization of the Firm and Global Marketing	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo	
Aims	After completing the course the student will understand the processes of firm internationalization and global marketing. The learning outcomes of the course are the following:	
Content	<ol style="list-style-type: none"> 1. To recognize the characteristics of the international market environment 2. To assess and criticize the essential theories and frameworks of firm internationalization. 3. To analyze the key management decisions connected with the internationalization of the firm and global marketing: Whether to internationalize, deciding which markets to enter, deciding how to enter the foreign market, designing the global marketing programme. 4. To be able to collaborate in cross-cultural teams 5. To create and deliver a group presentation focusing on the mentioned internationalization decisions in a given Finnish company. Chain of strategic decisions related to internationalization of the firm and global marketing, internationalization motives and barriers, Internationalization theories (Uppsala model, Network approach, Born Global), international market selection process, factors influencing entry mode choice, characteristics of various entry modes (export modes, intermediate entry modes, hierarchical modes), designing the global marketing programme. Concept of value chain in internationalization, comparison of SMEs and LSEs in internationalization and global marketing, environmental analysis in deciding which market to enter (political, economic, sociocultural, and technological environment).	
Modes of Study	Principles of transaction cost analysis. 21 hours of lectures with interactive mini-case studies, 2nd period. 14 hours of exercises including case study and group assignment (written report and class presentations), 2nd period. 4 hours of preparation for case exercise, 25 hours of preparation and writing for group assignment, 5 hours of preparation for group presentation, 88 hours of preparation for lectures and exam, 3 hours of writing the exam Total course 160 h.	
Evaluation	Final grade 0-5. Evaluation 0-100 points: written exam 70 points group assignment 30 points casework passed/failed.	
Study materials	All assignments must be passed to acquire the final grade. <ol style="list-style-type: none"> 1. Hollensen, S. (2007) Global Marketing – A decision-oriented approach (older editions apply as well), Prentice Hall. 2. Welch, L. Benito, G., and Petersen, B. (2008) Foreign operation methods: Theory, analysis, strategy, Edward Elgar Publishing. 3. Additional reading and material assigned in class. 	
Prerequisites	Basic knowledge of international marketing.	
A330A0300	STRATEGIC GLOBAL MARKETING MANAGEMENT	6 ECTS cr
	Strategic Global Marketing Management	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1	
Teacher(s)	Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, Professor, D.Sc. (Econ. &	

<p>Aims</p>	<p>Bus. Adm.) Olli Kuivalainen Person in Charge: Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen After taking the course the students should be able to: 1. identify the underlying concepts and theoretical perspectives of marketing management strategy, 2. assess firm's internal and external environments from strategic marketing management perspective 3. describe and assess the range of marketing strategies available to organizations in a range of environmental contexts 4. describe and assess marketing programmes 5. understand the basics in marketing performance measurement 6. develop a marketing plan 7. design and deliver a professional presentation of a marketing plan. After completing the course student will be able to: identify the underlying concepts and theoretical perspectives of marketing management strategy; explain the scope and the role of strategic global marketing analysis, formulation, choice, evaluation and implementation; evaluate the marketing strategies of global organizations and assess how the marketing strategies adopted in particular organizations have contributed to organizational performance; describe and assess the range of marketing strategies available to organizations in a range of environmental contexts; assess strategic options that will be responsive to changes facing a business; identify and assess the strategies based on sustainable competitive advantage; develop a global mindset in marketing management.</p>
<p>Content</p>	<p>Assessment of the competitiveness of the firm, assessment of the external marketing situation, STP-process, developing marketing strategies and programmes, standardization versus adaptation, relationships in value chain, budgeting, controlling, marketing plan, marketing performance measurement. Corporate social responsibility strategy, customer behavior, customer relationship management.</p>
<p>Modes of Study</p>	<p>Lectures, 4 assignments, workshop, seminar, exam. In-class (36 hours): 2 hour introductory lecture 4 hour workshop 20 hours of lectures 10 hours of term paper presentations in a seminar meeting Out-class (124 hours): 10 hours for lecture preparation 42 hours for exam preparation 24 hours for preparing assignments 43 hours for preparing term paper 5 hours for preparing a presentation Course total: 160 hours Blackboard in use.</p>
<p>Evaluation</p>	<p>Final grade 0-5. Evaluation 0-100 points: Assignments 1-3 passed/failed. Assignment 4 (i.e. term paper, a groupwork) (40 points). Presentation of term paper (10 points). Exam (50 points).</p>
<p>Study materials</p>	<p>All assignments must be passed to acquire the final grade. 1. Hollensen, Svend (2010) Marketing Management. A Relationship Approach. Second Edition. FT Prentice Hall. 2. Assigned readings.</p>
<p>Prerequisites</p>	<p>Basics in Marketing.</p>

A340A0050	KNOWLEDGE MANAGEMENT AND NETWORKS	6 ECTS cr
	Knowledge Management and Networks	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Kirsimarja Blomqvist, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Paavo Ritala, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kaisa Henttonen	
Aims	Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Kirsimarja Blomqvist Students have learned to	
Content	<ul style="list-style-type: none"> - understand theoretical background of knowledge management in networks - collect data on, analyze and interpret the structure of knowledge-intensive networks - identify and analyze the knowledge management challenges and best practices in knowledge-intensive networks - Knowledge as a key production factor - Key concepts related to knowledge and networks - Various forms of knowledge-intensive intra- and inter-firm collaboration, innovation ecosystems - Alliance, collaboration and network orchestration capability - Case assignments on knowledge intensive network collaboration - Social network analysis in theory and practice - Ucinet-software 	
Modes of Study	Lectures and seminar 28 h, 2. periodi, Independent preparation for lectures 32 h Group assignments 100 h Total workload 160 h. Blackboard in use.	
Evaluation	Grade 0-5, evaluation 0-100 points Case exercise as a group assignment 50% Social network analysis as a group assignment 50%.	
Study materials	Distributed at lectures or blackboard.	
A350A0000	BUSINESS PROCESS MANAGEMENT AND INFORMATION TECHNOLOGIES	3 ECTS cr
	Business Process Management and Information Technologies	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4	
Teacher(s)	Visiting Professor Sofya Zhukova	
Aims	Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio The course aim is to give students understanding how to change and improve business processes on the base of complex analysis of organization key activities in order to add value to business. Students gain knowledge to create horizontal process management structures through documenting, mapping, analyzing, simulating and validating business processes.	
Content	<p>Topic 1. System analysis and business modeling Thinking in systems. Business systems. The benefits of formalization. Models vs. systems. Models types: conceptual, physical, functional, mathematical models. Goals of using models in management.</p> <p>Topic 2. Formal models of business processes Abstraction concepts. Fundamental terms of control theory and business process management. Queuing theory basics. From business functions to business processes shift.</p> <p>Topic 3. Business process mapping and visualization Visualizing business dimensions. Types of diagram modelling: mind-maps, flowcharts, RD, CFD, AFD.</p>	

<p>Modes of Study</p> <p>Evaluation</p> <p>Study materials</p>	<p>Topic 4. Business process management Approaches within BPM: people, technology. Business process management life-cycle. BPM and quality management: TQM, Six Sigma, BPR. Change management techniques.</p> <p>Topic 5. Industry standards and notations Object-oriented approach to modeling. IDEF standards. ARIS methodology. Business modeling languages: UML, BPMN, BPEL, WS-CDL.</p> <p>Topic 6. Business process improvement and reengineering Business process improvement types. Creating AS-IS and TO-BE models. What-If analysis.</p> <p>Topic 7. Business Process Automation Automation field. Business processes and Web-technologies. Business process optimization and KPI.</p> <p>Lectures 20 h, 4th period. Individual class assignments 20 h, case studies 20 h, computer labs 20 h. Total workload for student 80 h.</p> <p>Graded 0-5 on the basis of the exam (50%) and course work (50%), evaluation 0-100 points.</p> <p>Required reading</p> <ol style="list-style-type: none"> 1. Sofya V. Zhukova. Guidelines for students' work on BPM: main deadlines and deliverables, 2010. 2. Pradeep Hari Pendse: Business Analysis - Visualizing Business Processes and Effective Software Solutions, Prentice-Hall, 2008. 3. Robert D. Austin, Richard L. Nolan, Shannon O'Donnell, Adventures of an IT Leader, Harvard Business Press, 2009 <p>Optional reading</p> <ol style="list-style-type: none"> 1. John Jeston, Johan Nelis Business Process Management: Practical Guidelines to Successful Implementations, Butterworth-Heinemann, 2006 . – 464 p. 2. Adrienne Curry, Peter Flett, and Ivan Hollingsworth: Managing Information and Systems: The Business Perspective. Routledge, 2005 3. H. James Harrington, K. C. Esseling, Van Nimwegen Business Process Improvement Workbook: Documentation, Analysis, Design, and Management of Business Process Improvement, McGraw-Hill, 1997. - 314 p. 4. Michael Havey, Essential Business Process Modeling O'Reilly, 2005. - 350 p. 5. Hans-Erik Eriksson, Magnus Penker Business Modeling with UML: Business Patterns at Work, Wiley, 2000. - 480 p. 6. Stephen A. White, Business Process Modeling Notation, IBM Corporation http://bpmi.org 7. Course tutorial. IBM WebSphere Business Modeler: Process Mapping and Analysis, 2007 8. Course tutorial. IBM WebSphere Business Modeler: Process Simulation and Analysis, 2007
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A350A0050	BUSINESS RESEARCH METHODS	6 ECTS cr
<p>Year and Period</p> <p>Teacher(s)</p> <p>Aims</p>	<p>Business Research Methods</p> <p>M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2 Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Paavo Ritala</p> <p>After completing the course, the students are able to</p> <ul style="list-style-type: none"> - understand the basic concepts of philosophy of science and research - understand the specific features of qualitative and quantitative research - define and plan research objectives and choose the research approach based on those objectives - apply focal methods of qualitative and quantitative research on gathering and analysis of empirical material - report the methods and research results related to qualitative and quantitative research - analyze the quality, reliability and validity of qualitative and quantitative research 	

166 Business Administration

Content	Basic principles of philosophy of science, The objectives of doing research, Research process, Choice of research methods, The specific features of qualitative and quantitative research, Data gathering, methods, analysis and reporting, Analysis of the quality of research. Combining the qualitative and quantitative research approaches.
Modes of Study	Lectures 27 h, independent reading assignments and preparation for lectures 24 h Exercises on quantitative data gathering and analysis 9 h Written exam and preparation for exam 60 h Total workload for student 160 h Blackboard in use
Evaluation	Grading 0-5, evaluation 0-100 points Learning assignments in groups 50 points Written exam 50 points
Study materials	Both assignments and exam must be passed with acceptable evaluation. Lecture slides Saunders, M, Lewis, P. and Thornhill, A. (2009). Research methods for business students, 5th ed., FT/Prentice Hall.

A350A0100	CONSULTING PROJECT AT LUT	6 ECTS cr
	Consulting Project at LUT	
	The maximum amount of participants is 25. Preference is given to MITIM and MIMM students and after that to Master's Students of LUT School of Business. In the possible selection of students, attention will be given to getting a versatile group from different areas of specializations.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Adjunct Professor, D.Sc (Econ.), Lic. Pol. Sc Timo Santalainen Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	By the end of the course the students will 1. Master key strategic concepts, tools and frameworks for strategizing. 2. Recognize the roles, styles and practices of strategy consulting in different situations. 3. Be able to apply strategic concepts, tools and frameworks in solving the consulting case problem. 4. Be able to outline a professional written report based on the results of their analysis and contributions. 5. Be able to communicate their findings and recommendations in a convincing, professional way.	
Content	Consulting Project at LUT is focused on strategy consulting with a very hands-on approach to learning: students take the role of strategy consultants to solve a case organization's concrete problem. The course and its ways of working are designed to help participants to explore strategic issues of selected companies/organizations from three perspectives: academic research and concepts (A), business practice (B), and consulting (C). Taking the role of strategy consultants participants are expected to develop value-generating ideas for their respective case organizations. The course is also aimed at the development of business "softskills" such as teamwork, leadership, project management, presentation and other communication skills. Core content: Evolving motivations and approaches in strategic management and thinking within the context of (hyper)competitive multinational business arenas. Conceptual tools for strategic situational analysis. The logic of developing customer-centric and resource-based strategies as well as value-capturing business models. Alternative roles, styles and practices of strategy consulting.	

Modes of Study	<p>Additional content: Alternative modes and tools of "strategizing" in case- as well as in real business situations. Information collection and problem solving skills. Effective presentation skills. Prework: Reflective essay: appr. 30 h (reading and preparation of the essay) 16 hours of lectures (Kick-off workshop, attendance compulsory) 16 hours of seminars, including final presentations of the projects to the evaluation committee Independent project work in teams: 90 h (finding literature, group meetings, Information gathering, analysis, writing the report) Written final report, presentation of the project work (preparation 8 h) Total student workload: 160 h</p>
Evaluation	<p>Grade 0-5, evaluation 0-100 points. Max 100 points from project work. Grading of projects: 30% case company 20% academic advisors 50% evaluation committee</p>
Study materials	<p>Santalainen, Timo (2006) Strategic Thinking, Talentum Handout materials relating to topics of each seminar Strategy consulting tools Other material depending on the project work</p>

A350A0150	<i>CORPORATE STRATEGY FOR EMERGING MARKETS</i>	6 ECTS cr
Year and Period	Corporate Strategy for Emerging Markets	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 3 Visiting professor Andrei Panibratov, GSOM St. Petersburg State University Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	The learning outcomes of the course are the following: - to analyze how MNCs develop strategy for an emerging economy (Finnish firms in Russia as a core example); - to examine why and how companies from less developed countries compete internationally; - to assess how emerging markets' companies organize their resources and capabilities to achieve competitive success in international context; - to outline what specific managerial approaches Russian companies use when entering and organizing activities in foreign countries.	
Content	Must know: Internationalization: emerging market perspective; Developing coordination and control for emerging markets; Inward and outward FDI in emerging economies; The rise of emerging markets' multinationals; Strategic choices for emerging MNCs; Core content: - Course subject and terminology. - Internationalization: emerging market perspective. - Developing coordination and control for emerging market. - Emerging economy: inward and outward FDI. - The rise of emerging markets' multinationals. - Strategic choice for emerging MNCs. - Evolution of Russian multinationals. - Organizational challenges and boundaries of Russian firms abroad. - Russian MNCs international strategies. Additional content: - Globalization of markets and internationalization of firms. - Approaches to foreign market entry. Greenfield and M&A. - Inward and outward perspective of internationalization.	

	<ul style="list-style-type: none"> - Knowledge flows within multinational corporations. - Strategy for less developed economies: lessons from global firms. - The evolution of the organizational landscape in emerging economies. - The determinants of MNC activity in emerging economy. - Configurations of strategy and structure in MNC subsidiaries. - Investment decisions for emerging markets. - Factors of MNC's success in Russia. - Partnerships and strategic alliances for Russian markets - Joint ventures. Building successful partnerships in Russia. - The phenomenon of emerging multinationals. - Russian MNCs: entry strategies and post entry operations. - Natural resource and technology as alternative orientations of Russian MNCs. <p>Special content:</p> <ul style="list-style-type: none"> - the peculiarity of the strategy development for the emerging economy - the process of building the structure and strategy of Finnish firms in Russia, and the boundaries of MNC - specifics of investments to and from emerging economy, and motives and perspectives of inward and outward FDI - terminology and concepts of emerging firms' internationalization, the difference between 'global' and 'multinational' - strategic choice of MNC when internationalizing operations, and how to carry out the analysis the MNC environment - features of EMNC international strategies, and peculiarities of Russian firms' entry to foreign markets - the most important principles of international strategies of internationalizing firms with the focus to the Russian companies
Modes of Study	<p>45 h of lectures in the 3rd period Case studies and project work In- and out-class assignments Active participation Total student workload 160 h, out of which 115 hours is spent out-class (preparation for assignments, case studies and project work)</p>
Evaluation	<p>Final grade 0–5, evaluation 0–100 points. In-class activity 30 % Midterm assignment 30% Course project in study group 40%</p>
Study materials	<p>Basic reading Bartlett C.A., Ghoshal S., Beamish P.W. Transnational Management: Text, Cases, and Readings in Cross-Border Management, 5th ed., Irwin / McGraw-Hill, Boston (Mass), 2008 Larcon J.-P. Chinese Multinationals, World Scientific Publishing Co, 2009 Ramamurti, R., Singh, J.V. Emerging Multinationals in Emerging Markets, Cambridge University Press, 2009</p> <p>Cases to be available prior the course: Brazilian multinationals: Vale, Petrobras, Embraer. Chinese multinationals: Bird, Haier, and TLC. Finnair: Re-Discover Russian Market. KGK goes to Brazil Nokian Tyres in Russia. Skanska: Leaving Russian Market – Failure or Part of the Strategy? YIT in Russia.</p> <p>Cases to be distributed and discussed within the course: Lukoil mini case Nordea vs Alfa Bank Fortum vs Gasprom</p> <p>Other required reading: Clercq, D., Sapienza, H.J. Crijns, H. The Internationalization of Small and Medium-Sized Firms, Small Business Economics, 2005, 24: 409-419. Cuervo-Cazurra, A., Genc, M. Transforming Disadvantages into Advantages: Developing Countries MNEs in the Least Developed Countries, Journal of International Business Studies, 2008, 39: 957-979.</p>

Dong, B., Zou, Sh., Taylor, Ch.R. Factors That Influence Multinational Corporations' Control of Their Operations in Foreign Markets: An Empirical Investigation, *Journal of International Marketing*, 2008, 16(1): 98-119.

Filippov, S. Think Tank: Emerging into Europe. Foreign Direct Investments. London: Apr/May 2009.

Freeman, S., Cavusgil, S.T. Toward a Typology of Commitment States Among Managers of Born-Global Firms: A Study of Accelerated Internationalization, *Journal of International Marketing*, 2007, 15(4): 1-40.

Luo, Y., Tung, R.L. International Expansion of Emerging Market Enterprises: A Springboard Perspective, *Journal of International Business Studies*, 2007, 38: 481-498.

Panibratov, A. Internationalization Process of Russian Construction Industry: Inward Investments Perspective, *Journal for East European Management Studies*, 2009, 2: 210-228.

Panibratov, A. Russian Multinationals: Entry Strategies and Post-Entry Operations, *Electronic Publications of Pan-European Institute*, Turku School of Economics, Finland, 2010, 15.

Panibratov, A., Kalotay, K. Russian Outward FDI and its Policy Context, *Vale Columbia Center on Sustainable International Investment*, Columbia University, 1, October 13, 2009.

Ramamurti, R. What have we learned about emerging-market MNEs? in Ramamurti, R., Singh, J.V., *Emerging Multinationals in Emerging Markets*, Cambridge University Press, 2009.

Zhanming, J. Corporate Strategies of Chinese Multinationals, in Larcon J.-P. *Chinese Multinationals*, World Scientific Publishing Co, 2009: 1-29.

Zuohao, H., Gao, W. International Marketing Strategies of Chinese Multinationals: The Experience of Bird, Haier, and TLC, in Larcon J.-P. *Chinese Multinationals*, World Scientific Publishing Co, 2009: 99-126.

A350A0200	INTRODUCTION TO ECONOMICS	6 ECTS cr
	Introduction to Economics	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1	
Teacher(s)	Associate Professor, Ph.D. Jorma Sappinen, Professor, D.Sc. (Econ. & Bus. Adm.) Kalevi Kyläheiko, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen	
Aims	By the end of the course, students will be able to describe the principles of modern market economy. Students will be able to explain the basic concepts of microeconomics and macroeconomics and can apply models of consumer, firm, markets and economy in simple situations. In addition, students can analyse the role and consequences of monetary and fiscal policy.	
Content	Principles of microeconomics and macroeconomics. Demand, supply and market equilibrium, production and markets for the factors of production, economics of the public sector. Economic growth, unemployment, inflation, economic fluctuations, monetary and fiscal policy.	
Modes of Study	Web course. Independent preparation for Blackboard assignments and Blackboard assignments 160 h. Total workload for student 160 h.	
Evaluation	Grade 0-5, evaluation 0-100 points, Blackboard-assignments 100%	
Study materials	1. Mankiw, N.G. - Taylor, M.P.: <i>Economics</i> , 1st ed. or older edition of the same book Mankiw, N.G.: <i>Principles of Economics</i> , 3rd ed. 2. Collection of articles	
A350A0250	MULTIVARIATE AND ECONOMETRIC ANALYSIS METHODS	6 ECTS cr
	Multivariate and Econometric Analysis Methods	
	Course is suitable for postgraduate studies.	

Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4
Teacher(s)	Professor, D.Sc. (Tech.) Kaisu Puumalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen
Aims	The aim of the course is to give extensive general knowledge about the main econometric and multivariate analysis methods. After completion of the course students: <ul style="list-style-type: none"> - understand the role of multivariate analysis in scientific research - can evaluate and compare the applicability of various multivariate methods - are able to estimate collect numerical data about the market environment in different countries - can apply multivariate analysis methods for cross-sectional, panel and time series data - can conduct the analyses with SAS software - can interpret and evaluate the results of the analyses - can report the results according to good scientific practice General aim of the course is to improve following personal skills of the students: <ul style="list-style-type: none"> - written and oral communication - group work skills in a multicultural team context - problem solving and project management skills
Content	Measure development and factor analysis, cluster analysis, linear regression, linear models, logistic regression, autocorrelation, stationarity, panel data regression Use of SAS software, use of international databases of statistical data. Special features of countries.
Modes of Study	Lectures 21 h, exercises 21 h, independent data collection and analysis using the SAS software 55 h, 3rd period. Seminar 8 h, independent analysis, writing of report and preparing for presentation 55 h, 4th period. Total workload for student 160 h.
Evaluation	Final grade 0-5, evaluation 0–100 points, written report 75%, oral 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

A350A0300	TECHNOLOGY AND INNOVATION MANAGEMENT	6 ECTS cr
	Technology and Innovation Management	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1-2, Period 2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio, Professor, Ph.D. Karl-Erik Michelsen, Professor, D.Sc. (Econ. & Bus. Adm.) Aino Kianto Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	<ol style="list-style-type: none"> 1. To recognize different types and sources of innovations 2. To interpret how technology changes and how technologies and society interact 3. To characterize the key features of an innovative organization 4. To assess how firms manage both technological and business innovations 5. To analyze the evolutionary process of innovation development 6. To synthesize and critically evaluate the commonly available information 7. To reflect individual and team contribution to team innovativeness 	
Content	The course explores the concept of innovation from various points of view: What are innovations, how they are made and how they affect company's strategy and performance. In modern large scale corporations innovations are necessary instruments for growth and competitive edge. Yet, innovation process must be managed and maintained and this requires strategic thinking,	

	<p>vision and courage as well as a particular kind of organizational culture. This course explores how core technologies are created and how they are developed further to serve the needs of company business strategy. Innovativeness is based on the creativity of individual employees as well as group processes and organizational characteristics that support the creation of new knowledge. Global companies use transparent innovation process in order to facilitate to serve the customers. This course also explores how users affect innovations and what is the role of customer in innovation process. Finally, innovations are not made in isolation, but rather in a context that is affected by regional, national and trans-national innovation systems.</p> <p>After completing the course, the students know how a firm manages its R&D and creates core technologies which are bases for innovation strategy. They also know what kind of elements innovative group work and continuously renewing organizations are built upon. How the R&D is organized in-house and how it is connected to the regional, national and trans-national innovation systems.</p> <p>Core content: What is an innovation and how innovations are made Innovation typologies: e.g. incremental vs. radical/discontinuous/disruptive innovations. Technological and business innovations. Individual creativity How technology changes and what are the causes of change. The role of R&D and innovations in established firms The role of R&D in new start-up firms Innovative teams Organizational renewal capability Role of innovations in business strategy Process of new product development Commercialization of new innovations Technology adoption life cycle Additional knowledge: Value creation through technology partnerships and networks Innovations and business models Evaluation of team innovativeness and organizational renewal capability The role of customers and users in R&D process. Innovation, technology and growth.</p> <p>Modes of Study In-class hours: Lectures: 30 h; Seminars: 8 h Out-class hours: Preparation for term paper: 56 h; Preparation for lectures:16 h; Preparation for exam:50 h. Total student workload: 160 h Blackboard in use.</p> <p>Evaluation Final grade 0-5. Evaluation 0-100 points, written exam 60 points, term paper 40 points. All assignments must be passed to get the final grade.</p> <p>Study materials Tidd, J. & Bessant, J. (2010) Managing Innovation: Integrating Technological, Market and Organizational Change. 4th Edition. John Wiley & Sons Ltd. Selected articles.</p>
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A350A0350	STRATEGIC MANAGEMENT	6 ECTS cr
<p>Year and Period Teacher(s) Aims</p>	<p>Strategic Management</p> <p>Only MITIM students are admitted to this course.</p> <p>M.Sc. (Econ. & Bus. Adm.) 1, Period 1 Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio</p> <ol style="list-style-type: none"> 1. To learn the key concepts of strategic management. 2. To assess the challenges of strategic management in rapidly changing environments. 3. To apply the tools of strategy analysis. 	

Content	4. To evaluate the implications of globalization on strategic management. Core content: Concept of strategy The tools of strategy analysis The analysis of competitive advantage Corporate strategy Globalization and strategic management
Modes of Study	In-class hours: Introductory lecture: 2 h; essay seminar 4 h; oral examination: 2 h. Out-class hours: Preparation of essays 80 h; preparation for oral exam 70 h; preparation for the essay seminar 2 h. Total student workload: 160 h
Evaluation	Grade 0-5, evaluation 0-100 points. Individual essays: 50 points Essay presentation: 10 points Individual oral examination: 40 points
Study materials	1. Grant, Robert M.: Contemporary Strategy Analysis. 6th Edition, Blackwell Publishing. 2008. 2. Lasserre, Philippe: Global Strategic Management. 2nd Edition, Palgrave Macmillan. 2007. (selected chapters)

A350A9000	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.) Liisa-Maija Sainio
Aims	Upon completion of the course, students should be able to carry out a research project independently and to report on the research in written format according to scientific practices. Students will be able to delimit and to define the purpose and the topic of the research. They know the theory and research methods relevant to their main subject. Students are able to justify and explain the conclusions of the research both in an oral presentation and in written format. Students can assess, evaluate and analyze theses written by other students and defend their own research plan in the seminar. Students will be able to collect, analyze and choose relevant literature based on critical evaluation. They will demonstrate the ability to compare, analyze and to combine information based on literature and empirical material.
Content	LUT MITIM students participate in first year sessions at LUT, whereas GSOM MITIM students attend the seminars in GSOM. For the second year, the seminar sessions are integrated with LUT and GSOM. Core knowledge: Defining a research topic with a research gap. Writing a research proposal. Acquiring the basic skills for conducting qualitative research. Writing a literature review. Creating a theoretical framework. Synthesizing theories for the research topic. Academic writing. Applying adequate methodological tools for the topic. Additional knowledge: Evaluation criteria. The correct referencing technique. Formatting and structure of the thesis.
Modes of Study	The research seminar consists of 16 hours of introductory lectures (first year) and 63 hours of seminar sessions (second year), where the students present their research proposal and different phases of their research. The last research seminar is a so-called pre-defense seminar and maturity test. Total workload including Master's Thesis is 800 hours.
Evaluation	The analysis of the research topic needs to be accepted by the supervising

	<p>professor. Presence in all research seminar sessions is compulsory, and all phases of the research process (research proposal, literature review, research plan, final thesis manuscript) have to be documented at an approved level. The Master's thesis and final examination have to be accepted. The Master's thesis is graded 0 – 5 (improbatur – laudatur)</p> <p>Maturity test: pass - fail.</p>
A390A0200	<p>KASVUN STRATEGINEN JOHTAMINEN 6 op</p>
Ajankohta	KTM 1, periodi 4
Opettaja(t)	professori, KTT Timo Pihkala, N. N.
Tavoitteet	<p>Opintojakson tavoitteena on tarjota opiskelijoille syvälinen perehtyminen yritysten kasvustrategioihin, niiden taustateorioihin ja kasvun analyysiin.</p> <p>Opintojakson suoritettuaan opiskelija</p> <ul style="list-style-type: none"> - osaa hahmottaa yrityksen kasvun problematiikkaa, taustoja, esteitä ja toteuttamistapoja - osaa iiketoiminnan kasvuun liittyvät keskeiset käsitteet ja teoriat - analysoida kasvun johtamisen mahdollisuuksia ja haasteita - analysoimaan kasvutilanteita ja - pystyy osallistumaan kasvustrategioiden kehittämistyöhön.
Sisältö	<p>Opiskelija pystyy hahmottamaan kasvun strategisen johtamisen kokonaisuuden. Hän tuntee kasvustrategioita koskevaa keskeistä tutkimusta. Kurssilla käsitellään mm. Yrityksen ja yrittäjän tavoitteet, yrityksen kasvun ja strategian keskinäinen yhteys, strategisten kehittämissuuntien kasvuvaihtoehdot, yrityksen ulkopuolinen kasvu.</p> <p>Opiskelija pystyy soveltamaan kasvustrategiaan liittyviä keskeisiä teorioita omassa tutkimustyössään.</p>
Suoritustavat	<p>Luentoja 20 h, itsenäiset lukehtävät ja valmistautuminen luennoille 28 h, 4 periodi. Harjoituksia, sisältäen case-tehtäviä ryhmissä ja kirjalliset raportit.</p> <p>Aineiston keruu, raporttien laatiminen, itsenäiset ryhmäkokoontumiset 42 h, 4 periodi. Tentti ja tenttiin valmistautuminen 60 h, 4 periodi. Kokonaismitoitus yhteensä 160 h.</p>
Arvostelu	Arvosana 0-5, arvostelu 0-100 pistettä, tentti 50%, case-raportit 50%, kaikki osiot suoritettava.
Oppimateriaalit	Artikkelikokoelma, luentomateriaali ja muu luennoitsijan ilmoittama materiaali.
Edellytykset	AC30A0050 Liiketoiminnan perusteet tai A130A0500 Liiketoiminnan ja strategian perusteet
A390A0450	<p>ORGANIZATION THEORY 6 ECTS cr</p>
	<p>Organization Theory</p> <p>Replaces AC30A0700 - Organisaatioteoria</p>
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Iiro Jussila
Aims	<p>After taking the course a student will be familiar with fundamental perspectives to organization theory, to compare these and contrast them. The student is able to explain theory building and application. In addition, the student is able to acquire, analyze and evaluate knowledge from organization theory perspective.</p>
Content	<p>The background, metaphors, and perspectives of organization theory.</p> <p>Organization and environment. Organizational social structure. Technology.</p> <p>Organizational culture. The physical structure of organizations. Organizational power, control, and conflict. New directions in organization theory.</p> <p>Theorizing and conclusions. Research process and the generation of scientific knowledge. Dissemination and use of scientific knowledge.</p> <p>Scientific journals and their evaluation practices.</p>
Modes of Study	Lectures 20 h. Pre-lecture reading of the subject to be learned (the study

Evaluation	book), 20 h. Post-lecture recap (lecture materials + study book), 20 h. Independently written "reaction paper" about one of the main course themes. Independent literary assignment of acquiring, analyzing, and evaluating information, 20 h. Written exam and preparation for the exam, 60 h, 1. period. Total workload for the student 160 h. Final grade 0–5. Evaluated on scale 0–100 points. Reaction paper 20%, Information acquiring, analysis, and evaluation assignment 20%. Examination 60%.
Study materials	1. Hatch, M. J. (1997 or more recent edition). Organization Theory: Modern, Symbolic, and Postmodern Perspectives. Oxford University Press.
Prerequisites	2. Other course material. B.Sc. studies.

CS30A1670	SERVICE INNOVATION AND MANAGEMENT	5 ECTS cr
	Service Innovation and Management	
	Due to the teaching methods, the amount of participants may be limited. In this case the priority would be given to the students of Master's degree Programme in Industrial Management.	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Teacher(s)	1. Associate Professor, D.Sc. (Tech.) Ville Ojanen	
Aims	2. Student can 1. recognize and categorize the variety of services and service firms in modern industrial environment as well as understand their influence in management of industrial innovations 2. identify the characteristics of services and evaluate the similarities, differences and links between services and physical products 3. define the dimensions of service innovations 4. explain the processes of new service development 5. summarize the main managerial challenges in service innovation management 6. select and apply the suitable frameworks, tools and methods, to overcome some typical real-world challenges in service innovation management 7. explain the significance, main principles and roles of value networks in service delivery and development.	
Content	3. Typologies of service firms. Characteristics of services. Product-service systems in manufacturing industry. Knowledge-intensive business services. New service development process: sources of service ideas, development of service strategies and culture, service design. Dimensions of service innovations. Productization of services. Supporting methods for service innovation management. Managerial challenges in service innovation management. Utilization of frameworks, methods and tools in service innovation management. Roles of different types of firms in service systems and networks. Value creation through services. Customer-centric service development.	
Modes of Study	4. Lectures 12 h, 1st period. Preparation for the lectures 4 h, 1st period. Writing case reports in groups 16 h, 1st period. Starting project work 12 h, 1st period. Lectures and exercises 8 h, 2nd period. Seminars 12 h, 2nd period. Writing project work 56 h, 2nd period. Altogether 120 h. Blackboard is used in this course.	
Evaluation	5. 0-5, written reports and seminars 100 %	
Study materials	6. Lecture notes. Other material, books and articles announced in the	

Prerequisites	beginning of the course. 7. Recommended: B.Sc on Industrial Engineering and Management, or equivalent knowledge
CS10A0852	EUROPEAN UNION – COMPETITIVENESS AND 5 ECTS cr ENLARGEMENT
	European Union – Competitiveness and Enlargement
Year and Period	M.Sc. (Tech.) 1, Period 4
Teacher(s)	8. Professor, D.Sc. (Tech.) Juha Väättänen
Aims	9. Student is able to 1. assess the competitiveness of EU in global economy 2. explain the process of European Union enlargement and it's influence on the competitiveness of EU 3. identify the factors affecting competitiveness and analyze the state and development of a country according to these measures.
Content	10. European Union global competitiveness. Enlargement process and profiles of new EU members. Trade and investment flows. Country competitiveness research methodologies.
Modes of Study	11. Lectures 21 h, seminar work and presentation 40 h, course literature 35 h, self study and exam preparation 30 h. Total 126 h.
Evaluation	12. 0-5, exam 60 %, presentation 40%
Study materials	13. UNCTAD, World Investment Report 2011, United Nations 2011. World Economic Forum, Global Competitiveness report 2011-2012. WEF 2011. Tiusanen, T., Karhu, A.: Twenty Years of Post-Communist Transition in Europe. Northern Dimension Research Centre, Publication n:o 56, Lappeenranta University of Technology 2009. Additional material will be announced on lectures.
Prerequisites	14. 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

6.3 MASTER'S DEGREE PROGRAMME IN INTERNATIONAL MARKETING MANAGEMENT (MIMM)

International exchange is recommended (but not compulsory) in the MIMM programme. We recommend students to study 24-30 ECTS abroad. There are three options concerning what to study abroad. First, students can do their minor during the exchange studies (needs to be negotiated beforehand). Secondly, students can take courses that fit with their elective core studies (12 ECTS) and language courses. Thirdly, students can also study some of the obligatory core studies during international exchange (this option is available only in a couple of foreign universities and needs to be negotiated beforehand). The recommended time for international exchange is Spring semester during the first year of studies.

Students can also include maximum 10 ECTS international work experience (mainly ERASMUS internships) into the degree. Of these 10 ECTS, 6 ECTS can be included in the core studies (by replacing one of the elective courses), and the rest 4 ECTS will go above the degree minimum of 120 ECTS. Two weeks of foreign internship corresponds to 1 ECTS.

The language studies, which the faculty grants on the basis of foreign studies or foreign work experience can be included in obligatory language studies.

The Degree Structure

Core Studies	36	ECTS cr
Specialization Studies	54	ECTS cr
Minor Studies	24-25	ECTS cr
Language Studies	6	ECTS cr
Credits	120 – 121 (min.)	ECTS cr

Recommended minor studies in Business and Technology in Russia (24-25 ECTS cr)

Students will read 12 ECTS in marketing, 12 ECTS in international business and 12 ECTS in technology management during their core studies.

Core Studies in Marketing, International Business and Technology Management

Marketing 12 ECTS cr

<i>Obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A330A0300 Strategic Global Marketing Management	M.Sc. (Econ. & Bus. Adm.)	1 1	6

And one of the following:

<i>Electives</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A330A0050 Customer Relationship Management	M.Sc. (Econ. & Bus. Adm.)	1 4	6
A330A0000 Contemporary Issues in International Marketing	M.Sc. (Econ. & Bus. Adm.)	1	6

International Business 12 ECTS cr

<i>Obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A330A0250 Internationalization of the Firm and Global Marketing	M.Sc. (Econ. & Bus. Adm.)	1 2	6

And one of the following:

<i>Electives</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A210A0050 Comparative International Accounting: Theory and Practice	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
A220A0250 Managerial Finance	M.Sc. (Econ. & Bus. Adm.)	1 3	6
A390A0450 Organization Theory	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6

Technology Management 12 ECTS cr

<i>Obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A350A0100 Consulting Project at LUT	M.Sc. (Econ. & Bus. Adm.) 1	3-4	6
A350A0300 Technology and Innovation Management	M.Sc. (Econ. & Bus. Adm.) 1-2		6
	2		

Specialization Studies in Marketing, International Business and Technology Management 54 ECTS cr

<i>Obligatory</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A130A0350 ¹⁾ Kvantitatiiviset tutkimusmenetelmät		1-2	6
A130A0400 ¹⁾ Laadulliset tutkimusmenetelmät		4	6
A330A0100 International Business Strategies	M.Sc. (Econ. & Bus. Adm.) 2	1-2	6
A330A0150 International Entrepreneurship	M.Sc. (Econ. & Bus. Adm.) 2	1-2	6
A330A0200 International Marketing of High Technology Products and Innovations	M.Sc. (Econ. & Bus. Adm.) 2	1	6
A350A0250 ¹⁾ Multivariate and Econometric Analysis Methods	M.Sc. (Econ. & Bus. Adm.) 1	3-4	6
A330A9000 ²⁾ Master's Thesis, International Marketing Management	M.Sc. (Econ. & Bus. Adm.) 2	1-2 and 3-4	30

¹⁾ Exchangeable

²⁾ In case a student has included courses Kvantitatiiviset tutkimusmenetelmät/Monimuuttujamenetelmät and Laadulliset tutkimusmenetelmät/Kvalitatiiviset tutkimusmenetelmät into the bachelor degree, (s)he cannot include these courses to a master's degree. In these cases, students need to take one 6 ECTS cr master level marketing course.

³⁾ In 2011-2012 course is also offered during period 1-2

**Recommended minor studies in Business and Technology in Russia
Business and Technology in Russia 20/25 op**

<i>Alternative Studies, select at least 20/25 ECTS cr</i>		<i>per.</i>	<i>ECTS cr</i>
A220A0150	International Finance and Emerging Markets	2	6
A350A0150	Corporate Strategy for Emerging Markets	3	6
BJ40A0300	Management of Technical Information in Export of Processing Equipment to Russian Federation	Intensive	5
BH60A2800	Energy and Environmental Challenges in Russia	3	5
CS10A0751	Enterprises and Competition in Russia	3	6
CS10A0800	The Basics of Doing Business in Russia	2	5
FV14A1200 ¹⁾ cr	Venäjä 1	1-2, 3-4	3
FV14A1400 ¹⁾	Venäjä 2	1-2, 3-4	3
FV14A1801 ¹⁾	Venäjän sijamuodot	3-4	3
FV14A4200 ¹⁾	Nykyvenäjän kieltä ja maantuntemusta		3

¹⁾ Exchangeable

²⁾ Only one Russian language course can be included to the minor. Language courses are alternative to each other and should be selected according to the student's language skills.

The Courses Offered in English

		ECTS cr
A210A0050	Comparative International Accounting: Theory and Practice	6
A220A0150	International Finance and Emerging Markets	6
A220A0250	Managerial Finance	6
A330A0000	Contemporary Issues in International Marketing	6
A330A0050	Customer Relationship Management	6
A330A0100	International Business Strategies	6
A330A0150	International Entrepreneurship	6
A330A0200	International Marketing of High Technology Products and Innovations	6
A330A0250	Internationalization of the Firm and Global Marketing	6
A330A0300	Strategic Global Marketing Management	6
A330A9000	Master's Thesis, International Marketing Management	30
A350A0100	Consulting Project at LUT	6
A350A0150	Corporate Strategy for Emerging Markets	6
A350A0250	Multivariate and Econometric Analysis Methods	6
A350A0300	Technology and Innovation Management	6
A390A0450	Organization Theory	6

A130A0350	KVANTITATIIVISET TUTKIMUSMENETELMÄT 6 op
	Quantitative Research Methods
	Kurssi tulee suorittaa ennen kandiseminaarin aloittamista. Korvaa kurssin AB40A0100 - Monimuuttujamenetelmät
Ajankohta	KTK 2, periodi 1-2
Opettaja(t)	professori, TkT Kaisu Puumalainen
Tavoitteet	Opintojakson suoritettuaan opiskelija <ul style="list-style-type: none"> - Ymmärtää kvantitatiivisen tutkimuksen ominaispiirteet - Osaa erotella kvantitatiivisen tutkimuksen tiedonhankinnan keskeiset menetelmät ja arvioida niiden soveltuvuutta eri tilanteisiin. - Tuntee keskeiset monimuuttujamenetelmät ja osaa soveltaa niitä aineiston analyysissä. - Osaa suunnitella ja raportoida tutkimuksessa käytettävät kvantitatiiviset menetelmät. - Ymmärtää ja osaa arvioida kvantitatiivisen tutkimuksen hyvyttä, reliabiliteettia ja validiteettia. - Osaa esitellä lyhyesti kvantitatiivisen tutkimuksen menetelmät ja tulokset seminaarissa.
Sisältö	Kvantitatiivisen tutkimuksen ominaispiirteet, kvantitatiivisen tutkimuksen tyypit ja tiedonhankinnan menetelmät, keskeiset monimuuttujamenetelmät (faktorianalyysi, regressioanalyysit ja lineaariset mallit), kvantitatiivisen tutkimuksen raportointi, reliabiliteetin ja validiteetin arviointi. SAS-ohjelmiston käyttö analyysissä.
Suoritustavat	Luennot 21 h, harjoitukset 18 h ja ryhmätyö 40 h, 1. periodi Harjoitukset 6 h, seminaarit 18 h ja ryhmätyö 57 h, 2. periodi Kokonaismitoitus 160 h.
Arvostelu	Arvosana 0-5, arvostelu 0-100 pistettä. Ryhmätyön kirjallinen raportointi 75 %. Ryhmätyön suullinen esitys 25 %.
Oppimateriaalit	Jaksot II ja VIII kirjasta Metsämuuronen, J. (2008). Tutkimuksen tekemisen perusteet ihmistieteissä. E-kirja.
Edellytykset	AC40A0010 Tilastollisen analyysin perusteet tai A130A0650 Tilastollisen tutkimuksen perusteet
Lisätietoja	Opintojaksolla on 10 opiskelupaikkaa avoimen yliopiston opiskelijoille. Lisätietoja avoimen yliopiston WWW-sivulta. Opintojakson harjoitusryhmiin ilmoittaudutaan WebOodissa.

A130A0400	LAADULLISET TUTKIMUSMENETELMÄT	6 op
	Qualitative Research Methods	
	Kurssi tulee suorittaa ennen kandidaatintutkielman seminaarin aloittamista. Korvaa kurssin AC30A0000 - Kvalitatiiviset tutkimusmenetelmät	
Ajankohta	KTK 1, periodi 4	
Opettaja(t)	professori, KTT Hanna-Kaisa Ellonen, tutkijaopettaja, FT Jorma Sappinen, nuorempi tutkija, KTM Pasi Tuominen	
Tavoitteet	Vastuuhenkilö(t): professori, KTT Hanna-Kaisa Ellonen Opintojakson suoritettuaan opiskelija osaa selittää tieteenfilosofian keskeiset peruskäsitteet. Opiskelija ymmärtää laadullisen tutkimuksen ominaispiirteet, osaa erotella laadullisen tutkimuksen tiedonhankinnan keskeiset strategiat ja arvioida niiden soveltuvuutta eri tilanteisiin. Opiskelija osaa erotella keskeiset laadullisen aineiston hankinnan metodit ja arvioida niiden soveltuvuutta eri tilanteisiin. Opiskelija osaa erotella keskeiset laadullisen aineiston analyysimetodit ja soveltaa niitä aineiston analyysissä. Opiskelija osaa suunnitella ja raportoida tutkimuksessa käytettävät laadulliset menetelmät, sekä ymmärtää ja osaa arvioida laadullisen tutkimuksen hyvyttä, reliabiliteettia ja validiteettia.	
Sisältö	Laadullisen tutkimuksen ominaispiirteet, tieteenfilosofian peruskäsitteet, laadullisen tutkimuksen tiedonhankinnan strategiat ja menetelmät, laadullisen aineiston analyysi, laadullisen tutkimuksen raportointi, tutkimuksen hyvyden arviointi.	
Suoritustavat	Laadullisen ja määrällisen tutkimusotteen yhdistäminen. Luennot 21 h ja itsenäinen luennoille valmistautuminen 36 h Itsenäinen oppimistehtävä 7 h Parityönä tehtävät oppimistehtävät 96 h Kokonaismitoitus 160 h, 4. periodi.	
Arvostelu	Arvosana 0-5, arvostelu 0-100 pistettä. Itsenäinen oppimistehtävä 10 %. Parityönä tehtävät oppimistehtävät 40 % ja 50 %.	
Oppimateriaalit	Jakso III "Laadullisen tutkimuksen perusteet" kirjasta Metsämuuronen, J. (2008). Tutkimuksen tekemisen perusteet ihmistieteissä. E-kirja. Alasuutari P. Laadullinen tutkimus, Vastapaino 1994 tai uudempi painos. Koskinen I., Alasuutari P. ja Peltonen T. Laadulliset menetelmät kauppatieteissä, Vastapaino 2005.	
Lisätietoja	Opintojaksolla on 10 opiskelupaikkaa avoimen yliopiston opiskelijoille. Lisätietoja avoimen yliopiston WWW-sivuilta.	
A210A0050	COMPARATIVE INTERNATIONAL ACCOUNTING: THEORY AND PRACTICE	6 ECTS cr
	Comparative International Accounting: Theory and Practice	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed, N. N.	
Aims	At the end of the course a student is expected to be able to: -compare and analyze accounting practices and quality of accounting information in different parts of the world -assess the international harmonization of accounting standards -analyze the impact of different social, financial, legal and taxation systems on accounting -interpret the practical implications of international differences in accounting -develop the communication and social skills through working in multi-cultural	

180 Business Administration

Content	groups for term paper and presentation The course is focused on international differences in accounting practices and quality of reported information associated with various social, legal and taxation systems. The harmonization of accounting standards and the practical implications of differences in accounting systems.
Modes of Study	Lectures: 24 h, period 1 Preparation for lectures and exam: 104 h, period 1-2 Term paper writing and presentation preparation: 28 h, period 1-2 Seminars: 4 h, period 2 Total workload: 160 h. Blackboard in use.
Evaluation	Grade 0-5, evaluation on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both.
Study materials	Bonus points for active class participation. 1. Nobes and Parker: Comparative International Accounting, 2006 or later edition. 2. Handouts in the class and all additional material required by the lecturers.
Prerequisites	Compulsory bachelor's level courses in accounting and finance.

A220A0150	<i>INTERNATIONAL FINANCE AND EMERGING MARKETS</i> 6 ECTS cr
	International Finance and Emerging Markets The language of teaching is English.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem, visiting lecturers
Aims	At the end of the course the student is expected to know: - how the theory of international trade and finance is formed; - the basic relations in international asset pricing; - the specifics in Russian financial markets: stock, bond, money and derivative markets; - the specifics in corporate governance, privatization and corporate finance in Russia; - the latest issues in empirical financial research on the Russian market; - the special characteristics of other emerging markets: BRIC countries, Frontier emerging markets, the Emerging Europe and the Middle East; - what are the different sources of risks involved in emerging markets; - different episodes of financial crisis
Content	The course is designed to give advanced-level (Master) knowledge of International Finance and Emerging Markets. The course covers five different areas in International Finance and Emerging Markets: 1) international trade and finance, 2) international asset pricing, 3) multinational finance, 4) special characteristics of emerging financial markets, 5) different episodes of financial crisis.
Modes of Study	Lectures: 30 h, period 2 Preparation for lectures and exam: 94 h, period 2 term paper: 36 h, period 2 Total workload: 160 h Blackboard in use.
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and home assignments (20%). Students are required to achieve 50 percent of the maximum points in both. Bonus points for active class participation.
Study materials	1. Eiteman, Stonehill, and Moffett: "Multinational Business Finance". Pearson International, 2007, 11th edition. Selected parts.

Prerequisites	2. Research articles 3. Handouts in class and all additional material required by the lecturer Compulsory bachelor's level courses in finance and economics.
A220A0250	MANAGERIAL FINANCE 6 ECTS cr
	Managerial Finance
	The language of teaching is English.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem
Aims	At the end of the course, the student is expected to: - apply corporate finance theory in business strategies - compute and compare different techniques of valuing real assets; - evaluate investment decisions based on the riskiness of projects; - classify the impact of corporate taxes on asset valuation and financial decisions;
Content	- examine the affect of managerial incentives on financial decisions; - analyze the importance of risk management in corporate financial decisions. The core contents of the course cover six different areas in corporate finance: 1) financial markets and financial instruments, 2) valuation of financial assets, 3) valuation of real assets, 4) capital structure of firms, 5) managerial Incentives, Information and corporate control in financial decisions, 6) risk management.
Modes of Study	Lectures: 21 h, period 3 Preparation for lectures and exam: 105 h, period 3 Term paper writing: 34 h, period 3 Total workload: 160 h Blackboard in use.
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both.
Study materials	Bonus points for active class participation. 1. David Hiller, Mark Grinblatt and Sheridan Titman: Financial markets and corporate strategy – European edition 2007 (Text book) 2. Brealey Myers: Principles of corporate finance, seventh edition (additional readings) 3. Handouts in class and all additional material required by the lecturer
Prerequisites	Compulsory bachelor's level courses in finance and economics.
A330A0000	CONTEMPORARY ISSUES IN INTERNATIONAL MARKETING 6 ECTS cr
	Contemporary Issues in International Marketing
	The course has intensive teaching by an international visiting professor, complemented with an article package and independent study.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1
Teacher(s)	N. N. Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo
Aims	The learning outcomes of the course are the following: 1. To assess the contemporary concepts and issues ("hot topics") in international marketing. 2. To synthesize and evaluate contemporary international marketing phenomena. 3. To discuss and debate on special topic of international marketing (specified later) 4. To be able to collaborate in a cross-cultural teams.

Content	The specific content of this course will vary depending on the visiting international professor. However, the course covers chosen contemporary concepts and issues affecting international marketing today.
Modes of Study	30 hours of Intensive integrated lectures and exercises (assignments and cases) by the international guest lecturer 20 hours of preparation for exercises 30 hours of preparation for written exam 80 hours of individual independent study: reading the article package and writing of reflective essays Course total 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: Reflective essay (50 points) Written exam (30 points) Exercises (20 points)
Study materials	Material to be assigned in class.
Prerequisites	Basic knowledge of international marketing

A330A0050	CUSTOMER RELATIONSHIP MANAGEMENT 6 ECTS cr
	Customer Relationship Management
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Hanna Salojärvi, Professor, Ph.D Sanjit Sengupta Person in Charge: Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Hanna Salojärvi
Aims	The aim of the course is to familiarize the students with the theory of relationship marketing, customer relationship management, related concepts and models. After completing the course the students: - are able to define the main concepts and know the principles of relationship marketing theory - are able to define and explain the building blocks of long-term customer relationships - are familiar with customer relationship management as an organization-wide strategic approach to managing customer relationships both in B2C and B2B markets - are able to describe and assess different options to attract and retain customers both in B2B and B2C environments - are able to evaluate the performance of customer relationships - are able to analyze the customer base and apply various strategies for managing customer relationships General aim of the course is to improve following personal skills of the students: - SAS enterprise software skills for analyzing customers - ability to utilize high-quality sources in written assignments - problem solving project management skills for completing the customer analysis assignment in a given timeline - ability to produce fluent and analytical written report and contribute to discussion in class - ability to participate in teams and evaluate social interaction and the contribution of individual team members - ability to participate in multi-cultural teams and assess the social interaction within the team
Content	Relationship marketing as a novel marketing paradigm, the development and categorization of customer relationships, specific features and building blocks of long-term customer relationships, customer value creation and measurement of customer life-time value, the strategic framework for customer relationship management. The characteristics of a customer-relationship oriented firm, specific features of large customer management, challenges of CRM system implementation.

Modes of Study	Technical characteristics of front- and back-office CRM applications, call-centre management, loyalty schemes. 18 hours of lectures, 4th period. Preparation for lectures 12 h, 4th period. 14 hours of exercises. Preparation for term paper and case studies, 52 h, 4th period. Written exam and preparation for exam 64 h. Total workload for student 160 h.
Evaluation	Grade 0-5, evaluation 0-100 points, written exam 60 %, term paper 30 %, case assignments 10 %, all assignments must be passed to obtain final grade.
Study materials	1. Payne, Adrian (2006): Handbook of CRM: Achieving Excellence through Customer Management, Butterworth-Heinemann 2. Gupta, Sunil & Lehmann, Donald (2005), Managing Customers as Investments: The Strategic Value of Customers in the Long Run, Wharton School Publishing 3. Godson, Mark (2009), Relationship Marketing, Oxford University Press. 4. Assigned readings 5. Lecture slides 6. Additional material distributed in class
Prerequisites	Basic knowledge of international marketing. AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management recommended.

A330A0100	INTERNATIONAL BUSINESS STRATEGIES	6 ECTS cr
	International Business Strategies	
	The number of students attending the course may have to be limited based on a 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.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen	
Aims	<p>The aim of the course is to familiarize 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;</p> <p>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.</p> <p>After completing the course the students should be able to:</p> <ul style="list-style-type: none"> • analyse technology intensive international marketing environment, and to generate and carry out properly justified international business strategies. • decompose the corporate strategy into functional strategies (e.g. marketing or production strategy), and to coordinate and critically evaluate the implemented strategies, by interpreting key financial indicators of performance; • plan, communicate, and carry out a group research project applied to a firm in a simulation, • work in a multi-cultural team; • be able to interpret new information critically and systematically and be able to develop ideas and projects based on this information; • be able to apply knowledge gained from the course, in addition to that provided by additional reading, analysis and discussion, to the events, activities and/or strategies of an actual firm or organisation. • participate in discussion on topics of international business interest, and to stimulate and answer questions from a knowledgeable audience; <p>develop a mindset that fosters sustainability, and global, market and technology orientation in a global business environment</p>	

Content	The skills and application of critical inquiry into your reading, discussions, and situations and experiences that you encounter with regard to international business, both inside and outside the classroom setting. The international business planning process and its content especially related to international marketing. International and global business strategies. Strategic tools for analyzing the internal and external environment, for example resource and product positions. Organization of resources, capabilities and knowledge within a multinational corporation. Implementation methods of an international business strategy. International finance, international HRM, international production and sourcing strategies, corporate social responsibility. OLI paradigm, institutional theory, international technology strategy, real-life firm strategy examples (provided by a guest lecturer).
Modes of Study	18 h of interactive lectures, 1st period. 10 h of interactive lectures, 2nd period. Group assignment/project work based on simulation exercises in international groups (incorporating online simulation and written group assignments: a strategic plan and a reflective report) 97 h Mid-term tutorial (each group independently with tutors) 1 h Preparation for lectures and exam 34 h Written exam. Total course 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: Active class participation Assignment(s): oral and written project work in groups, 70 points Exam, 30 points
Study materials	All assignments (including the exam) must be passed. Lasserre, P: (2007). Global Strategic Management. Peng, M.W. (2006). Global Strategy (or a newer 2nd edition). Assigned reading (collection of articles). Guide manual for the simulation.
Prerequisites	Slides from the lectures. AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing

A330A0150	INTERNATIONAL ENTREPRENEURSHIP	6 ECTS cr
Year and Period	International Entrepreneurship	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2 Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo, Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen	
Aims	The learning outcomes of the course are the following: 1. to be able to analyze the processes of international entrepreneurship both from theoretical and practical standpoints. 2. to be able to evaluate the main characteristics of successful international entrepreneurs. 3. to be able to outline the nature, benefits and drawbacks of an international expansion strategy in entrepreneurial firms. 4. to be able to assess the actual opportunities and challenges that entrepreneurs have to deal with when internationalizing their businesses. 5. to be able to evaluate the variety of international marketing strategies available to organizations in a range of environmental contexts. 6. to be able to develop internationalization plan 7. to be able to apply the knowledge on entrepreneurial firm internationalization in knowledge and technology-intensive environments 8. To be able to collaborate in cross-cultural teams 9. To be able to design and deliver various kinds of presentations focusing on	

Content	international entrepreneurship and marketing for a corporate audience Evolution of international entrepreneurship as a field of study, 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, tools and frameworks in analysis of a particular international entrepreneurial opportunity and creation of a business plan. Characteristics of successful international entrepreneurs, specific features of knowledge-intensive, high tech and software industries.
Modes of Study	9 hours of lectures 3 hours of case narrative presentations 12 hours of field project presentations 0,5 hours of group tutorials 26 hours of preparation for lectures 13 hours of preparation for case narrative 62 hours of preparation for field project 1,5 hours of preparation for group tutorial 7 hours of preparation for field project presentation 26 hours of preparation for oral group exam and exam Total course 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: Active class and tutorial participation Assignment 1: Case narrative of chosen firm/ entrepreneur (10 points) Assignment 2: Field project & Presentation (50 points) (Peer evaluation in the group work has an effect on the grade) Oral group examination (40 points)
Study materials	All assignments must be passed to acquire the final grade. 1. Äijö Toivo, Kuivalainen Olli, Saarenketo Sami, Lindqvist Jani & Hanninen Hanna (2005) Internationalization Handbook for the Software Business, Centre of Expertise for Software Product Business, Espoo 2005. 2. Hisrich Robert D. (2009) International Entrepreneurship – Starting, Developing, and Managing a Global Venture, SAGE Publications. 3. Additional reading and material assigned in class.
Prerequisites	AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing

A330A0200	INTERNATIONAL MARKETING OF HIGH TECHNOLOGY PRODUCTS AND INNOVATIONS	6 ECTS cr
Year and Period	International Marketing of High Technology Products and Innovations	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 1 Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, Professor, Ph.D Sanjit Sengupta	
Aims	After the course, student should be able to: 1. interpret and analyze external high technology environments (e.g. relating to competitive landscape, consumer behavior, markets) in global scale 2. distinguish the special characteristics of high technology marketing environment (like the type of innovation, market and technology uncertainties, network externalities) and evaluate marketing management strategies in such environments 3. apply and develop transferable intellectual skills (like theory application, problem solving, information acquisition, analytical, communications, social and intercultural competence). Course aims to provide a deep understanding of the functions of marketing regarding challenges and opportunities in high technology products and	

Content	markets; assist the participants to understand the virtue and limitations of traditional marketing thinking and tools in emergent high technology markets. Contingency model of high technology marketing, Special characteristics of technology intensive markets, How to apply marketing tools in high technology companies.
Modes of Study	Industry evolution, innovation typologies, entry strategies, technology maps, technology paradox in pricing, launch strategies, innovation adoption and diffusion. Lectures, assignments, exam. In-class hours: 12 hours of lectures (2 h/week during 6 weeks) 20 hours of seminars (4h/week during 5 weeks) 3 hours of business case presentations Total in-class: 35 hours Out-class hours: 24 hours of exam preparation 5 hours for preparing for lectures 78 hours for doing assignments 5 hours for preparing presentation 13 hours for solving and presenting business case Total out-class: 125 hours Exam: 3 hours Total workload for student 160 h. Blackboard in use.
Evaluation	Final grade 0-5. Evaluation 0-100 points: Exam (30 points) Assignments (groupwork) (50 points). NOTE: Peer evaluation of the group work may effect on the grade. Presentation (10 points) Business case (10 points). All assignments except the business case which is voluntary must be passed to acquire a final grade.
Study materials	1. Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2010) Marketing of High-Technology Products and Innovations. Third Edition. Pearson Prentice Hall. 2. Assigned reading.
Prerequisites	AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing

A330A0250	<i>INTERNATIONALIZATION OF THE FIRM AND GLOBAL MARKETING</i> 6 ECTS cr
Year and Period	Internationalization of the Firm and Global Marketing
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1, Period 2 Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo
Aims	After completing the course the student will understand the processes of firm internationalization and global marketing. The learning outcomes of the course are the following: 1. To recognize the characteristics of the international market environment 2. To assess and criticize the essential theories and frameworks of firm internationalization. 3. To analyze the key management decisions connected with the internationalization of the firm and global marketing: Whether to internationalize, deciding which markets to enter, deciding how to enter the foreign market, designing the global marketing programme. 4. To be able to collaborate in cross-cultural teams 5. To create and deliver a group presentation focusing on the mentioned

Content	internationalization decisions in a given Finnish company. Chain of strategic decisions related to internationalization of the firm and global marketing, internationalization motives and barriers, Internationalization theories (Uppsala model, Network approach, Born Global), international market selection process, factors influencing entry mode choice, characteristics of various entry modes (export modes, intermediate entry modes, hierarchical modes), designing the global marketing programme. Concept of value chain in internationalization, comparison of SMEs and LSEs in internationalization and global marketing, environmental analysis in deciding which market to enter (political, economic, sociocultural, and technological environment).
Modes of Study	Principles of transaction cost analysis. 21 hours of lectures with interactive mini-case studies, 2nd period. 14 hours of exercises including case study and group assignment (written report and class presentations), 2nd period. 4 hours of preparation for case exercise, 25 hours of preparation and writing for group assignment, 5 hours of preparation for group presentation, 88 hours of preparation for lectures and exam, 3 hours of writing the exam Total course 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: written exam 70 points group assignment 30 points casework passed/failed.
Study materials	All assignments must be passed to acquire the final grade. 1. Hollensen, S. (2007) Global Marketing – A decision-oriented approach (older editions apply as well), Prentice Hall. 2. Welch, L. Benito, G., and Petersen, B. (2008) Foreign operation methods: Theory, analysis, strategy, Edward Elgar Publishing. 3. Additional reading and material assigned in class.
Prerequisites	Basic knowledge of international marketing.

A330A0300	STRATEGIC GLOBAL MARKETING MANAGEMENT	6 ECTS cr
Year and Period	Strategic Global Marketing Management	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1, Period 1 Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen Person in Charge: Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen	
Aims	After taking the course the students should be able to: 1. identify the underlying concepts and theoretical perspectives of marketing management strategy, 2. assess firm's internal and external environments from strategic marketing management perspective 3. describe and assess the range of marketing strategies available to organizations in a range of environmental contexts 4. describe and assess marketing programmes 5. understand the basics in marketing performance measurement 6. develop a marketing plan 7. design and deliver a professional presentation of a marketing plan. After completing the course student will be able to: identify the underlying concepts and theoretical perspectives of marketing management strategy; explain the scope and the role of strategic global marketing analysis, formulation, choice, evaluation and implementation; evaluate the marketing strategies of global organizations and assess how the	

Content	marketing strategies adopted in particular organizations have contributed to organizational performance; describe and assess the range of marketing strategies available to organizations in a range of environmental contexts; assess strategic options that will be responsive to changes facing a business; identify and assess the strategies based on sustainable competitive advantage; develop a global mindset in marketing management. Assessment of the competitiveness of the firm, assessment of the external marketing situation, STP-process, developing marketing strategies and programmes, standardization versus adaptation, relationships in value chain, budgeting, controlling, marketing plan, marketing performance measurement. Corporate social responsibility strategy, customer behavior, customer relationship management.
Modes of Study	Lectures, 4 assignments, workshop, seminar, exam. In-class (36 hours): 2 hour introductory lecture 4 hour workshop 20 hours of lectures 10 hours of term paper presentations in a seminar meeting Out-class (124 hours): 10 hours for lecture preparation 42 hours for exam preparation 24 hours for preparing assignments 43 hours for preparing term paper 5 hours for preparing a presentation Course total: 160 hours
Evaluation	Blackboard in use. Final grade 0-5. Evaluation 0-100 points: Assignments 1-3 passed/failed. Assignment 4 (i.e. term paper, a groupwork) (40 points). Presentation of term paper (10 points). Exam (50 points).
Study materials	All assignments must be passed to acquire the final grade. 1. Hollensen, Svend (2010) Marketing Management. A Relationship Approach. Second Edition. FT Prentice Hall. 2. Assigned readings.
Prerequisites	Basics in Marketing.

A330A9000	MASTER'S THESIS, INTERNATIONAL MARKETING MANAGEMENT	30 ECTS cr
Year and Period	Master's Thesis, International Marketing Management	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2 and 3-4 Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo, Honorary Professor, Ph.D John W. Cadogan	
Aims	The aim of the research seminar is to support students' process of writing a thesis and conducting scientific research. The overall goal of the thesis is for the student to display the knowledge and capability required for independent work as a Master of Science in Economics and Business Administration and especially in the area of international marketing management. After completing the thesis, students will be able to carry out independently a scientific research project and will thus be able to: delimit and define a research topic and tasks; demonstrate an ability to independently identify and formulate issues and to plan and, using appropriate methods, carry out advanced tasks within specified time limits; demonstrate knowledge and understanding in their main field of study, together with insight into current research;	

Content	demonstrate deeper methodological knowledge in their main field of the study; demonstrate an ability to integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations; demonstrate an ability to report scientific research in written academic format; clearly present and discuss conclusions and the knowledge and arguments behind them. The research seminar consists of three different parts. 1) Introductory lectures 6 hours 2) Research seminars: presentations of research plans, and 3) Mid-term examination of Master's thesis: comments on an almost final version of the Master's thesis. The seminar gives basic knowledge on how to conduct a research project.
Modes of Study	Must know: finding a good topic, showing a research gap, writing a research proposal, creating a theoretical framework, the structure of the thesis, synthesizing theories, academic writing, applying methodological tools Should know: evaluation criteria, formatting issues, referencing. Active participation (minimum 50% of meetings). Written research proposal. Presentation of a research proposal. Written and oral feedback on others' research proposals. Master's Thesis. Maturity Test.
Evaluation	Thesis: laudatur (best grade), eximia cum laude approbatur, magna cum laude approbatur, cum laude approbatur, non sine laude approbatur, lubenter approbatur, approbatur, improbatur (failed). Maturity Test: pass - fail.
Study materials	Material distributed in class.
Prerequisites	Compulsory Master's degree courses. Recommended also AB40A0100 Monimuuttujamenetelmät OR A130A0400 Laadulliset tutkimusmenetelmät OR A350A0250 Multivariate and Econometric Analysis Methods

A350A0100	CONSULTING PROJECT AT LUT	6 ECTS cr
	Consulting Project at LUT	
	The maximum amount of participants is 25. Preference is given to MITIM and MIMM students and after that to Master's Students of LUT School of Business. In the possible selection of students, attention will be given to getting a versatile group from different areas of specializations.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Adjunct Professor, D.Sc (Econ.), Lic. Pol. Sc Timo Santalainen Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	By the end of the course the students will 1. Master key strategic concepts, tools and frameworks for strategizing. 2. Recognize the roles, styles and practices of strategy consulting in different situations. 3. Be able to apply strategic concepts, tools and frameworks in solving the consulting case problem. 4. Be able to outline a professional written report based on the results of their analysis and contributions. 5. Be able to communicate their findings and recommendations in a convincing, professional way.	
Content	Consulting Project at LUT is focused on strategy consulting with a very hands-on approach to learning: students take the role of strategy consultants to solve a case organization's concrete problem. The course and its ways of working are designed to help participants to explore strategic issues of selected companies/organizations from three perspectives: academic research and concepts (A), business practice (B), and consulting (C). Taking the role of strategy consultants participants are expected to develop value-generating	

	<p>ideas for their respective case organizations.</p> <p>The course is also aimed at the development of business “softskills” such as teamwork, leadership, project management, presentation and other communication skills.</p> <p>Core content:</p> <p>Evolving motivations and approaches in strategic management and thinking within the context of (hyper)competitive multinational business arenas.</p> <p>Conceptual tools for strategic situational analysis.</p> <p>The logic of developing customer-centric and resource-based strategies as well as value-capturing business models.</p> <p>Alternative roles, styles and practices of strategy consulting.</p> <p>Additional content:</p> <p>Alternative modes and tools of “strategizing” in case- as well as in real business situations.</p> <p>Information collection and problem solving skills.</p> <p>Effective presentation skills.</p>
Modes of Study	<p>Prework: Reflective essay: appr. 30 h (reading and preparation of the essay)</p> <p>16 hours of lectures (Kick-off workshop, attendance compulsory)</p> <p>16 hours of seminars, including final presentations of the projects to the evaluation committee</p> <p>Independent project work in teams: 90 h (finding literature, group meetings, Information gathering, analysis, writing the report)</p> <p>Written final report, presentation of the project work (preparation 8 h)</p>
Evaluation	<p>Total student workload: 160 h</p> <p>Grade 0-5, evaluation 0-100 points. Max 100 points from project work.</p> <p>Grading of projects:</p> <p>30% case company</p> <p>20% academic advisors</p> <p>50% evaluation committee</p>
Study materials	<p>Santalainen, Timo (2006) Strategic Thinking, Talentum</p> <p>Handout materials relating to topics of each seminar</p> <p>Strategy consulting tools</p> <p>Other material depending on the project work</p>

A350A0150	<i>CORPORATE STRATEGY FOR EMERGING MARKETS</i>	6 ECTS cr
Year and Period	Corporate Strategy for Emerging Markets	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 3	
Aims	<p>Visiting professor Andrei Panibratov, GSOM St. Petersburg State University</p> <p>Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio</p> <p>The learning outcomes of the course are the following:</p> <ul style="list-style-type: none"> - to analyze how MNCs develop strategy for an emerging economy (Finnish firms in Russia as a core example); - to examine why and how companies from less developed countries compete internationally; - to assess how emerging markets' companies organize their resources and capabilities to achieve competitive success in international context; - to outline what specific managerial approaches Russian companies use when entering and organizing activities in foreign countries. 	
Content	<p>Must know:</p> <p>Internationalization: emerging market perspective;</p> <p>Developing coordination and control for emerging markets;</p> <p>Inward and outward FDI in emerging economies;</p> <p>The rise of emerging markets' multinationals;</p> <p>Strategic choices for emerging MNCs;</p> <p>Core content:</p> <ul style="list-style-type: none"> - Course subject and terminology. - Internationalization: emerging market perspective. 	

	<ul style="list-style-type: none"> - Developing coordination and control for emerging market. - Emerging economy: inward and outward FDI. - The rise of emerging markets' multinationals. - Strategic choice for emerging MNCs. - Evolution of Russian multinationals. - Organizational challenges and boundaries of Russian firms abroad. - Russian MNCs international strategies. <p>Additional content:</p> <ul style="list-style-type: none"> - Globalization of markets and internationalization of firms. - Approaches to foreign market entry. Greenfield and M&A. - Inward and outward perspective of internationalization. - Knowledge flows within multinational corporations. - Strategy for less developed economies: lessons from global firms. - The evolution of the organizational landscape in emerging economies. - The determinants of MNC activity in emerging economy. - Configurations of strategy and structure in MNC subsidiaries. - Investment decisions for emerging markets. - Factors of MNC's success in Russia. - Partnerships and strategic alliances for Russian markets - Joint ventures. Building successful partnerships in Russia. - The phenomenon of emerging multinationals. - Russian MNCs: entry strategies and post entry operations. - Natural resource and technology as alternative orientations of Russian MNCs. <p>Special content:</p> <ul style="list-style-type: none"> - the peculiarity of the strategy development for the emerging economy - the process of building the structure and strategy of Finnish firms in Russia, and the boundaries of MNC - specifics of investments to and from emerging economy, and motives and perspectives of inward and outward FDI - terminology and concepts of emerging firms' internationalization, the difference between 'global' and 'multinational' - strategic choice of MNC when internationalizing operations, and how to carry out the analysis the MNC environment - features of EMNC international strategies, and peculiarities of Russian firms' entry to foreign markets - the most important principles of international strategies of internationalizing firms with the focus to the Russian companies <p>Modes of Study</p> <p>45 h of lectures in the 3rd period Case studies and project work In- and out-class assignments Active participation</p> <p>Total student workload 160 h, out of which 115 hours is spent out-class (preparation for assignments, case studies and project work)</p> <p>Evaluation</p> <p>Final grade 0–5, evaluation 0–100 points. In-class activity 30 % Midterm assignment 30% Course project in study group 40%</p> <p>Study materials</p> <p>Basic reading Bartlett C.A., Ghoshal S., Beamish P.W. Transnational Management: Text, Cases, and Readings in Cross-Border Management, 5th ed., Irwin / McGraw-Hill, Boston (Mass), 2008 Larcon J.-P. Chinese Multinationals, World Scientific Publishing Co, 2009 Ramamurti, R., Singh, J.V. Emerging Multinationals in Emerging Markets, Cambridge University Press, 2009</p> <p>Cases to be available prior the course: Brazilian multinationals: Vale, Petrobras, Embraer. Chinese multinationals: Bird, Haier, and TLC. Finnair: Re-Discover Russian Market. KGK goes to Brazil Nokian Tyres in Russia. Skanska: Leaving Russian Market – Failure or Part of the Strategy?</p>
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	<p>YIT in Russia. Cases to be distributed and discussed within the course: Lukoil mini case Nordea vs Alfa Bank Fortum vs Gasprom Other required reading: Clercq, D., Sapienza, H.J. Crijns, H. The Internationalization of Small and Medium-Sized Firms, <i>Small Business Economics</i>, 2005, 24: 409-419. Cuervo-Cazurra, A., Genc, M. Transforming Disadvantages into Advantages: Developing Countries MNEs in the Least Developed Countries, <i>Journal of International Business Studies</i>, 2008, 39: 957-979. Dong, B., Zou, Sh., Taylor, Ch.R. Factors That Influence Multinational Corporations' Control of Their Operations in Foreign Markets: An Empirical Investigation, <i>Journal of International Marketing</i>, 2008, 16(1): 98-119. Filippov, S. Think Tank: Emerging into Europe. <i>Foreign Direct Investments</i>. London: Apr/May 2009. Freeman, S., Cavusgil, S.T. Toward a Typology of Commitment States Among Managers of Born-Global Firms: A Study of Accelerated Internationalization, <i>Journal of International Marketing</i>, 2007, 15(4): 1-40. Luo, Y., Tung, R.L. International Expansion of Emerging Market Enterprises: A Springboard Perspective, <i>Journal of International Business Studies</i>, 2007, 38: 481-498. Panibratov, A. Internationalization Process of Russian Construction Industry: Inward Investments Perspective, <i>Journal for East European Management Studies</i>, 2009, 2: 210-228. Panibratov, A. Russian Multinationals: Entry Strategies and Post-Entry Operations, <i>Electronic Publications of Pan-European Institute, Turku School of Economics, Finland</i>, 2010, 15. Panibratov, A., Kalotay, K. Russian Outward FDI and its Policy Context, <i>Vale Columbia Center on Sustainable International Investment, Columbia University</i>, 1, October 13, 2009. Ramamurti, R. What have we learned about emerging-market MNEs? in Ramamurti, R., Singh, J.V., <i>Emerging Multinationals in Emerging Markets</i>, Cambridge University Press, 2009. Zhanming, J. <i>Corporate Strategies of Chinese Multinationals</i>, in Larcon J.-P. <i>Chinese Multinationals</i>, World Scientific Publishing Co, 2009: 1-29. Zuohao, H., Gao, W. <i>International Marketing Strategies of Chinese Multinationals: The Experience of Bird, Haier, and TLC</i>, in Larcon J.-P. <i>Chinese Multinationals</i>, World Scientific Publishing Co, 2009: 99-126.</p>
A350A0250	<p>MULTIVARIATE AND ECONOMETRIC ANALYSIS METHODS 6 ECTS cr</p>
<p>Year and Period</p> <p>Teacher(s)</p> <p>Aims</p>	<p>Multivariate and Econometric Analysis Methods</p> <p>Course is suitable for postgraduate studies.</p> <p>M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4 Professor, D.Sc. (Tech.) Kaisu Puumalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen</p> <p>The aim of the course is to give extensive general knowledge about the main econometric and multivariate analysis methods. After completion of the course students:</p> <ul style="list-style-type: none"> - understand the role of multivariate analysis in scientific research - can evaluate and compare the applicability of various multivariate methods - are able to estimate collect numerical data about the market environment in different countries - can apply multivariate analysis methods for cross-sectional, panel and time series data - can conduct the analyses with SAS software

Content	<ul style="list-style-type: none"> - can interpret and evaluate the results of the analyses - can report the results according to good scientific practice <p>General aim of the course is to improve following personal skills of the students:</p> <ul style="list-style-type: none"> - written and oral communication - group work skills in a multicultural team context - problem solving and project management skills <p>Measure development and factor analysis, cluster analysis, linear regression, linear models, logistic regression, autocorrelation, stationarity, panel data regression</p> <p>Use of SAS software, use of international databases of statistical data. Special features of countries.</p>
Modes of Study	Lectures 21 h, exercises 21 h, independent data collection and analysis using the SAS software 55 h, 3rd period. Seminar 8 h, independent analysis, writing of report and preparing for presentation 55 h, 4th period. Total workload for student 160 h.
Evaluation	Final grade 0-5, evaluation 0–100 points, written report 75%, oral 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

A350A0300	TECHNOLOGY AND INNOVATION MANAGEMENT	6 ECTS cr
	Technology and Innovation Management	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1-2, Period 2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio, Professor, Ph.D. Karl-Erik Michelsen, Professor, D.Sc. (Econ. & Bus. Adm.) Aino Kianto Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	<ol style="list-style-type: none"> 1. To recognize different types and sources of innovations 2. To interpret how technology changes and how technologies and society interact 3. To characterize the key features of an innovative organization 4. To assess how firms manage both technological and business innovations 5. To analyze the evolutionary process of innovation development 6. To synthesize and critically evaluate the commonly available information 7. To reflect individual and team contribution to team innovativeness 	
Content	<p>The course explores the concept of innovation from various points of view: What are innovations, how they are made and how they affect company's strategy and performance. In modern large scale corporations innovations are necessary instruments for growth and competitive edge. Yet, innovation process must be managed and maintained and this requires strategic thinking, vision and courage as well as a particular kind of organizational culture. This course explores how core technologies are created and how they are developed further to serve the needs of company business strategy.</p> <p>Innovativeness is based on the creativity of individual employees as well as group processes and organizational characteristics that support the creation of new knowledge. Global companies use transparent innovation process in order to facilitate to serve the customers. This course also explores how users affect innovations and what is the role of customer in innovation process. Finally, innovations are not made in isolation, but rather in a context that is affected by regional, national and trans-national innovation systems.</p> <p>After completing the course, the students know how a firm manages its R&D and creates core technologies which are bases for innovation strategy. They also know what kind of elements innovative group work and continuously</p>	

	<p>renewing organizations are built upon. How the R&D is organized in-house and how it is connected to the regional, national and trans-national innovation systems.</p> <p>Core content:</p> <p>What is an innovation and how innovations are made</p> <p>Innovation typologies: e.g. incremental vs. radical/discontinuous/disruptive innovations.</p> <p>Technological and business innovations.</p> <p>Individual creativity</p> <p>How technology changes and what are the causes of change.</p> <p>The role of R&D and innovations in established firms</p> <p>The role of R&D in new start-up firms</p> <p>Innovative teams</p> <p>Organizational renewal capability</p> <p>Role of innovations in business strategy</p> <p>Process of new product development</p> <p>Commercialization of new innovations</p> <p>Technology adoption life cycle</p> <p>Additional knowledge:</p> <p>Value creation through technology partnerships and networks</p> <p>Innovations and business models</p> <p>Evaluation of team innovativeness and organizational renewal capability</p> <p>The role of customers and users in R&D process.</p> <p>Innovation, technology and growth.</p>
Modes of Study	<p>In-class hours: Lectures: 30 h; Seminars: 8 h</p> <p>Out-class hours: Preparation for term paper: 56 h; Preparation for lectures:16 h; Preparation for exam:50 h.</p> <p>Total student workload: 160 h</p> <p>Blackboard in use.</p>
Evaluation	Final grade 0-5. Evaluation 0-100 points, written exam 60 points, term paper 40 points. All assignments must be passed to get the final grade.
Study materials	Tidd, J. & Bessant, J. (2010) <i>Managing Innovation: Integrating Technological, Market and Organizational Change</i> . 4th Edition. John Wiley & Sons Ltd. Selected articles.

A390A0450	ORGANIZATION THEORY	6 ECTS cr
	Organization Theory	
	Replaces AC30A0700 - Organisaatioteoria	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Iiro Jussila	
Aims	After taking the course a student will be familiar with fundamental perspectives to organization theory, to compare these and contrast them. The student is able to explain theory building and application. In addition, the student is able to acquire, analyze and evaluate knowledge from organization theory perspective.	
Content	The background, metaphors, and perspectives of organization theory. Organization and environment. Organizational social structure. Technology. Organizational culture. The physical structure of organizations. Organizational power, control, and conflict. New directions in organization theory. Theorizing and conclusions. Research process and the generation of scientific knowledge. Dissemination and use of scientific knowledge. Scientific journals and their evaluation practices.	
Modes of Study	Lectures 20 h. Pre-lecture reading of the subject to be learned (the study book), 20 h. Post-lecture recap (lecture materials + study book), 20 h. Independently written "reaction paper" about one of the main course themes. Independent literary assignment of acquiring, analyzing, and evaluating information, 20 h. Written exam and preparation for the exam, 60 h, 1. period.	

Evaluation	Total workload for the student 160 h. Final grade 0–5. Evaluated on scale 0–100 points. Reaction paper 20%, Information acquiring, analysis, and evaluation assignment 20%. Examination 60%.
Study materials	1. Hatch, M. J. (1997 or more recent edition). Organization Theory: Modern, Symbolic, and Postmodern Perspectives. Oxford University Press. 2. Other course material.
Prerequisites	B.Sc. studies.

6.4. MASTER´S DEGREE PROGRAMME IN STRATEGIC FINANCE (MSF)

The degree of Master of Science in Economics and Business Administration requires completing 120 ECTS credits during 2 years of full time studies.

The Degree Structure

Core Studies	60	ECTS cr
Specialized Minor Studies I	30	ECTS cr
Specialized Minor Studies II	24	ECTS cr
Language Studies	6	ECTS cr
Credits	120 (min.)	ECTS cr

Core Studies

<i>Obligatory (60 ECTS cr)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A210A0050 Comparative International Accounting: Theory and Practice	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
A220A0100 Financial Risk Management	M.Sc. (Econ. & Bus. Adm.)	2 1	6
A220A0200 International Financial Management	M.Sc. (Econ. & Bus. Adm.)	1 3	6
A220A0250 Managerial Finance	M.Sc. (Econ. & Bus. Adm.)	1 3	6
A220A0300 Theory of Corporate Finance	M.Sc. (Econ. & Bus. Adm.)	1 4	6
A220A9000 Master's Thesis, Strategic Finance	M.Sc. (Econ. & Bus. Adm.)	2 3-4	30

Specialized Minor Studies:

I: Strategic Research

II: International Financial Markets

Obligatory Minor: Strategic Research (30 ects cr)

<i>Electives (at least five of the following)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A210A0200 Empirical Strategy Research	M.Sc. (Econ. & Bus. Adm.)	1 3-4	6
A210A0350 Real Options and Managerial Decision Making	M.Sc. (Econ. & Bus. Adm.)	2 3, intensive	6
A330A0100 International Business Strategies	M.Sc. (Econ. & Bus. Adm.)	2 1-2	6
A350A0050 Business Research Methods	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
A350A0100 Consulting Project at LUT	M.Sc. (Econ. & Bus. Adm.)	1 3-4	6
A350A0150 Corporate Strategy for Emerging Markets	M.Sc. (Econ. & Bus. Adm.)	2 3	6
A350A0200 Introduction to Economics	M.Sc. (Econ. & Bus. Adm.)	1	6
A350A0250 Multivariate and Econometric Analysis Methods	M.Sc. (Econ. & Bus. Adm.)	1 3-4	6

Obligatory Minor: International Financial Markets (24 ECTS cr)

<i>Electives (at least four of the following)</i>	<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
A210A0150 Empirical Research in Accounting and Finance	M.Sc. (Econ. & Bus. Adm.)	2 3-4	6
A220A0000 Financial Econometrics	M.Sc. (Econ. & Bus. Adm.)	1 1-2	6
A220A0050 Financial Modeling Using Excel	M.Sc. (Econ. & Bus. Adm.)	1 4	6
A220A0150 International Finance and Emerging Markets	M.Sc. (Econ. & Bus. Adm.)	1 2	6
A220A0350 Valuation of Financial Securities and Value Creation: Theory and Practice	M.Sc. (Econ. & Bus. Adm.)	2 1, intensive	6

The Courses Offered in English

	<i>ECTS cr</i>	
A210A0050	Comparative International Accounting: Theory and Practice	6
A210A0150	Empirical Research in Accounting and Finance	6
A210A0200	Empirical Strategy Research	6
A210A0350	Real Options and Managerial Decision Making	6
A220A0000	Financial Econometrics	6
A220A0050	Financial Modeling Using Excel	6
A220A0100	Financial Risk Management	6
A220A0150	International Finance and Emerging Markets	6
A220A0200	International Financial Management	6
A220A0250	Managerial Finance	6
A220A0300	Theory of Corporate Finance	6
A220A0350	Valuation of Financial Securities and Value Creation: Theory and Practice	6
A220A9000	Master's Thesis, Strategic Finance	30
A330A0100	International Business Strategies	6
A350A0050	Business Research Methods	6
A350A0100	Consulting Project at LUT	6
A350A0150	Corporate Strategy for Emerging Markets	6
A350A0200	Introduction to Economics	6
A350A0250	Multivariate and Econometric Analysis Methods	6

A210A0050	COMPARATIVE INTERNATIONAL ACCOUNTING: THEORY AND PRACTICE	6 ECTS cr
	Comparative International Accounting: Theory and Practice	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed, N. N.	
Aims	At the end of the course a student is expected to be able to: -compare and analyze accounting practices and quality of accounting information in different parts of the world -assess the international harmonization of accounting standards -analyze the impact of different social, financial, legal and taxation systems on accounting -interpret the practical implications of international differences in accounting -develop the communication and social skills through working in multi-cultural groups for term paper and presentation	
Content	The course is focused on international differences in accounting practices and quality of reported information associated with various social, legal and taxation systems. The harmonization of accounting standards and the practical implications of differences in accounting systems.	
Modes of Study	Lectures: 24 h, period 1 Preparation for lectures and exam: 104 h, period 1-2 Term paper writing and presentation preparation: 28 h, period 1-2 Seminars: 4 h, period 2 Total workload: 160 h. Blackboard in use.	
Evaluation	Grade 0-5, evaluation on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both.	
Study materials	Bonus points for active class participation. 1. Nobes and Parker: Comparative International Accounting, 2006 or later	

Prerequisites	<p>edition.</p> <p>2. Handouts in the class and all additional material required by the lecturers.</p> <p>Compulsory bachelor's level courses in accounting and finance.</p>
A210A0150	EMPIRICAL RESEARCH IN ACCOUNTING AND FINANCE 6 ECTS cr
<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>Prerequisites</p>	<p>Empirical Research in Accounting and Finance</p> <p>The language of teaching is English.</p> <p>M.Sc. (Econ. & Bus. Adm.) 2, Period 3-4 Docent, D.Sc. (Econ. & Bus. Adm.) Jussi Nikkinen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen</p> <p>The course has the following objectives:</p> <ul style="list-style-type: none"> - 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 for empirical research in accounting and finance. - Upon the completion of the course, the student will have developed the ability to plan an empirical research project in accounting and finance. <p>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.</p> <p>Lectures/seminar: 21 h, period 3-4 Preparation for lectures and exam: 99 h, period 3-4 data exercises: 40 h, period 3-4 Total workload: 160 h. Blackboard in use.</p> <p>Grade 0–5 on the basis of the term paper, evaluation 0-100 points. There is no textbook. Issues covered in class will be based on research papers and articles.</p> <p>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 A130A0650 Tilastollisen tutkimuksen perusteet and A130A0350 Kvantitatiiviset tutkimusmenetelmät</p>
A210A0200	EMPIRICAL STRATEGY RESEARCH 6 ECTS cr
<p>Year and Period</p> <p>Teacher(s)</p> <p>Aims</p>	<p>Empirical Strategy Research</p> <p>All teaching will be held as intensive on Fridays, 3 hours of lecture+ 3 hours of exercise.</p> <p>M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4 Professor, D.Sc. (Tech.) Kaisu Puumalainen, Professor, D.Sc. (Econ. & Bus. Adm.) Ari Jantunen</p> <p>After taking the course the student</p> <ul style="list-style-type: none"> - knows the basic empirical application types of strategy research - is familiar with the evolution, state-of-the art and future directions of research within four different central themes of empirical strategy research - can independently select a specific theme related to strategy, technology or innovation research and conduct a critical and systematic literature review on

Content	<p>this theme</p> <ul style="list-style-type: none"> - collect and analyze empirical data around this theme, and subsequently report, interpret and evaluate the results and their practical and theoretical implications. <p>Four specific themes of strategy, technology or innovation research: empirical testing of main theories, research strategies and designs and main results. The themes may include e.g. resource-based view, strategic orientations, innovation and sustainable competitiveness of the firm. The themes are related to current research projects at LUT School of Business, and may vary each year.</p>
Modes of Study	<p>Measurement of firm performance, specific methods of empirical research, e.g. event study, social network analysis, diffusion models.</p> <p>Important authors and publication forums of empirical strategy research.</p> <p>Lectures 18 h , exercises 12 h and independent preparation for lectures + writing article reviews 40 h, 3rd period</p> <p>Seminar 12 h and pair assignment + preparing the presentation 78 h, 4th period</p>
Evaluation	<p>Total workload 160 h.</p> <p>Grade 0-5, evaluation 0-100 points.</p> <p>Article reviews 40%</p> <p>Written seminar report 40%</p> <p>Oral presentation of seminar assignment 20%</p>
Study materials	Collection of articles
Prerequisites	Quantitative research methods, recommended Basic course in econometrics

A210A0350	<i>REAL OPTIONS AND MANAGERIAL DECISION 6 ECTS cr MAKING</i>
	Real Options and Managerial Decision Making
	Replaces AB20A0950 - Reaaliotiot yrityksen päätöksenteossa
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 3, intensive
Teacher(s)	Docent, D.Sc. (Econ. & Bus. Adm.) Lauri Frank, docent, D.Sc. (Econ. & Bus. Adm.) Mikael Collan
Aims	<p>Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Kalevi Kyläheiko</p> <p>The aim of the course is to give extensive general knowledge about how to use the real options approach in the decision making of the firms and how to apply real options thinking under uncertainty. After the course the students are able to</p> <ul style="list-style-type: none"> - know the mathematical foundations of real options and the connections between the real options approach and financial theory - know the research tradition of real options and are able to evaluate the limits of the approach - apply the real options approach in the managerial decision situations where it is suitable - analyze the role of uncertainty and risk in information providing and decision making
Content	<ul style="list-style-type: none"> - recognize the limitations when applying real options approach <p>Real options vs. financial options, modeling the real options and the limits of modeling, the usability of real options in strategic decision making</p> <p>The use of mathematical tools applied in the real options context.</p> <p>How to use the real options approach in managerial decision making situations exemplified by means of different real cases.</p>
Modes of Study	<p>Lectures 21 h, independent reading assignments (articles) and preparation for lectures 45h, exercises 10 h. Written exam and preparation for the exam 85 h.</p> <p>Total workload for the student 160 h.</p>
Evaluation	Grade 0-5, evaluation 0-100 points, written exam 100%.
Study materials	<p>Lecture slides.</p> <p>Assigned reading, collection of articles.</p>

A220A0000	FINANCIAL ECONOMETRICS	6 ECTS cr
	Financial Econometrics	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem	
Aims	This course deepens students' knowledge on empirical research methods in financial econometrics. The focus is on the empirical techniques used most often in the analysis of financial markets and how they are applied to actual market data. At the end of this course a student is expected to be able to:	
Content	<ul style="list-style-type: none"> - conduct empirical tests on market efficiency; - test asset pricing models; - know how to formulate event studies; - model time series, volatility and correlation and co-integration analysis The course is designed to give advanced-level (Master) knowledge of financial econometrics. The course covers four different areas in econometrics: 1) univariate and multivariate statistical analyses, 2) time series models, 3) modeling volatility and correlation, 4) modeling long-run relationships in financial markets.	
Modes of Study	Lectures and exercises: 24 h, period 1 Preparation for lectures and exam: 100 h, period 1 home assignments: 36 h, period 1 Total workload: 160 h Blackboard in use.	
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and home assignments (20%). Students are required to achieve 50 percent of the maximum points in both.	
Study materials	Bonus points for active class participation. 1. Brooks, Chris: Introductory econometrics for finance. Cambridge, 2002 or newer (Text book) 2. Tsay, Ruey S.: Analysis of Financial Time Series. Wiley, 2002 or newer (additional readings) 3. Handouts in class and all additional material required by the lecturer	
Prerequisites	Compulsory bachelor's level courses in finance and economics.	
A220A0050	FINANCIAL MODELING USING EXCEL	6 ECTS cr
	Financial Modeling Using Excel	
	Language of teaching is English.	
	The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Mika Vaihekoski Person in Charge: Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed	
Aims	At the end of this course a student is expected to be able to:	
Content	<ul style="list-style-type: none"> - apply selected financial theories and models in practice using spreadsheet programs (mainly Excel) - understand the issues involved in transforming theoretical models into practice - use Excel more fluently - write simple macro programs using the VBA - build independently, models to solve financial problems using Excel Elective advanced studies -level course in Finance. Advanced use of Excel; building models for corporate finance, investment analysis, bond and stock pricing, portfolio management, and derivatives.	

Modes of Study	Basics of Excel's Visual Basic for Applications macro language. Lectures 21 h, period 4 (Intensive week of lectures) Preparation of lectures 29 h, period 4, Home assignments 66 h, period 4 Final Project 44 h, period 4 Total workload 160 h Blackboard in use.
Evaluation	Graded 0-5 on the basis of home assignments (weight 60 %) and final project (weight 40 %). Students are required to achieve 50 percent of the maximum in both.
Study materials	1. Vaihekoski, Mika: Rahoitusalan sovellukset ja Excel, WSOY, 2004 or Benninga, Simon: Financial Modeling, MIT Press, 2002 or newer.
Prerequisites	2. Handouts in the class and all additional material required by the lecturer. Compulsory B.Sc. courses (except Bachelor's thesis).

A220A0100	FINANCIAL RISK MANAGEMENT	6 ECTS cr
	Financial Risk Management	
	Replaces AB30A0150 - Johdannaisinstrumentit ja riskienhallinta	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1	
Teacher(s)	Professor, Ph.D Jukka Pertunen Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen	
Aims	Students will become familiar with the nature of financial risks and understand the basic methods of financial risk management. At the end of this course a student is expected to be able to:	
	<ul style="list-style-type: none"> - apply selected financial risk management theories in practice, - construct portfolio of risky assets, - calculate interest rates, market yields, swap and option prices, - understand principles of forward and futures contracts, - construct bond portfolios. 	
Content	The course introduces students to the basic concepts of financial risk management: evaluation and management of market risk (credit risk and operational risk). The course covers specific issues including asset price as a random variable, portfolio of risky assets, interest rates and market yields, bond price and interest rate risk, forward contracts on different assets, futures contracts, interest rate swaps, options on different assets, exchange-traded options, option strategies and value-at-risk.	
Modes of Study	Lectures: 30 h, period 1 Preparation for lectures and exam: 130 h, period 1 Total workload: 160 h Blackboard in use.	
Evaluation	Grade 0-5, on the basis of 0-100 points for the exams. Term exams (1 and 2) and a Final exam. Students are required to achieve 50 percent of the maximum points in all. Bonus points for active class participation.	
Study materials	1. Hull: Risk management and Financial institutions. Pearson. 2. Handouts in class and all additional material required by the lecturer.	

A220A0150	INTERNATIONAL FINANCE AND EMERGING MARKETS	6 ECTS cr
	International Finance and Emerging Markets	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem, visiting	

202 Business Administration

Aims	lecturers At the end of the course the student is expected to know: - how the theory of international trade and finance is formed; - the basic relations in international asset pricing; - the specifics in Russian financial markets: stock, bond, money and derivative markets; - the specifics in corporate governance, privatization and corporate finance in Russia; - the latest issues in empirical financial research on the Russian market; - the special characteristics of other emerging markets: BRIC countries, Frontier emerging markets, the Emerging Europe and the Middle East; - what are the different sources of risks involved in emerging markets; - different episodes of financial crisis
Content	The course is designed to give advanced-level (Master) knowledge of International Finance and Emerging Markets. The course covers five different areas in International Finance and Emerging Markets: 1) international trade and finance, 2) international asset pricing, 3) multinational finance, 4) special characteristics of emerging financial markets, 5) different episodes of financial crisis.
Modes of Study	Lectures: 30 h, period 2 Preparation for lectures and exam: 94 h, period 2 term paper: 36 h, period 2 Total workload: 160 h Blackboard in use.
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and home assignments (20%). Students are required to achieve 50 percent of the maximum points in both. Bonus points for active class participation.
Study materials	1. Eiteman, Stonehill, and Moffett: "Multinational Business Finance". Pearson International, 2007, 11th edition. Selected parts. 2. Research articles 3. Handouts in class and all additional material required by the lecturer
Prerequisites	Compulsory bachelor's level courses in finance and economics.

A220A0200	INTERNATIONAL FINANCIAL MANAGEMENT 6 ECTS cr
	International Financial Management
	The language of teaching is English.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed
Aims	At the end of this course a student is expected to be able to: - understand the structure and functions of MNCs - analyze cross-border financing and investment decisions - evaluate the different legal environments, tax considerations and country risks involved in the financial management of MNCs - assess the impacts of exchange rates on the profitability, growth and valuation of MNCs - know the valuation and risk management strategies used by multinational corporations - measure cross-border diversification benefits in order to undertake effective risk management strategies
Content	The course is designed to give advanced-level (Master) knowledge of multinational financial management. The course covers four different areas in international financial management: 1) currencies exchange rates risks and valuation, 2) multinational financial decision making, 3) cross-border financing and investment diversification and 4) institutions, risk management and investors' behavior.
Modes of Study	Lectures: 24 h, period 3

Evaluation	Preparation for lectures and exam: 104 h, period 3 Term paper writing: 32 h, period 3 Total workload: 160 h Blackboard in use. Grade 0-5, on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both.
Study materials	Bonus points for active class participation. 1. Madura and Fox: International Financial Management, 1st edition (European)
Prerequisites	2. Handouts in class and all additional material required by the lecturer Compulsory bachelor's level courses in finance and economics.

A220A0250	MANAGERIAL FINANCE	6 ECTS cr
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	Managerial Finance
	The language of teaching is English.
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem
Aims	At the end of the course, the student is expected to: - apply corporate finance theory in business strategies - compute and compare different techniques of valuing real assets; - evaluate investment decisions based on the riskiness of projects; - classify the impact of corporate taxes on asset valuation and financial decisions;
Content	- examine the affect of managerial incentives on financial decisions; - analyze the importance of risk management in corporate financial decisions. The core contents of the course cover six different areas in corporate finance: 1) financial markets and financial instruments, 2) valuation of financial assets, 3) valuation of real assets, 4) capital structure of firms, 5) managerial Incentives, Information and corporate control in financial decisions, 6) risk management.
Modes of Study	Lectures: 21 h, period 3 Preparation for lectures and exam: 105 h, period 3 Term paper writing: 34 h, period 3 Total workload: 160 h Blackboard in use.
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both.
Study materials	Bonus points for active class participation. 1. David Hiller, Mark Grinblatt and Sheridan Titman: Financial markets and corporate strategy – European edition 2007 (Text book) 2. Brealey Myers: Principles of corporate finance, seventh edition (additional readings)
Prerequisites	3. Handouts in class and all additional material required by the lecturer Compulsory bachelor's level courses in finance and economics.

A220A0300	THEORY OF CORPORATE FINANCE	6 ECTS cr
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	Theory of Corporate Finance
	The language of teaching is English
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed
Aims	At the end of this course the student is expected to be able to: - know the functions of a corporation related to finance

Content	<ul style="list-style-type: none"> - demonstrate advanced level skills in describing corporate finance theories - interpret the empirical analyses in the corporate finance literature in the light of theory - understand the link between the theoretical and practical aspects of corporate finance - deepen knowledge within certain specific areas of corporate finance with the help of research articles - develop new research agendas within the field of corporate finance. <p>The course provides advanced-level (master) knowledge based on the theoretical understanding of the main topics of corporate finance. The course covers specific issues including dividends, valuation models, mergers and acquisitions, public listings, IPOs, financing and investments, ownership structures, and corporate governance.</p>
Modes of Study	<p>Lectures: 24 h, period 3 Preparation for lectures and exam: 104 h, period 3 Term paper writing: 32 h, period 3 Total workload: 160 h Blackboard in use.</p>
Evaluation	<p>Grade 0-5, on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both.</p> <p>Bonus points for active class participation.</p>
Study materials	<ol style="list-style-type: none"> 1. Ross, S.A., Westerfield, R.W. – Jaffe, J.: Corporate Finance, 7th edition 2. Handouts in class and all additional material required by the lecturer.
Prerequisites	<p>Compulsory bachelor's level courses in finance.</p>

A220A0350	<p>VALUATION OF FINANCIAL SECURITIES AND 6 ECTS cr VALUE CREATION: THEORY AND PRACTICE</p>
	<p>Valuation of Financial Securities and Value Creation: Theory and Practice</p> <p>The language of teaching is English.</p>
Year and Period Teacher(s)	<p>M.Sc. (Econ. & Bus. Adm.) 2, Period 1, intensive Visiting lecturer: Professor George Athanassakos Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem</p>
Aims	<p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> - understand the analytical structure of how firm value is created and analyzed; - provide a thorough analysis of how debt securities are valued in the market; - analyze debt securities in practice; - provide a thorough analysis of how debt securities are valued in the market; - analyze equity is valued in practice
Content	<p>This course expands on the techniques of valuation presented in previous finance courses. The topics will include interest rate determination, discount rate setting, comparable ratio establishment, cash flow estimation and bond and equity valuation models. The principles involved will be explored and applied within the context of government and corporate debt pricing, equity valuation, value based management and value creation, valuation for mergers and acquisitions, capital structure and dividend policy. The use of databases for financial analysis based on group exercises will be integrated with lectures.</p>
Modes of Study	<p>Lectures: 21 h, period 1 (intensive week of lectures) Preparation for lectures: 28 h, period 1 Two data exercises: 95 h, period 1 Preparation for presentation: 16 h period 1 Total workload: 160 h.</p>
Evaluation	<p>Intensive course, attendance in all lectures is compulsory. Grade 0-5 based on 0-100 points from two data exercises, bond valuation (30%), equity valuation (50%) and presentation + class participation (20%). Students are required to achieve 50 percent of the maximum points in each</p>

Study materials	task to pass the course. 1. Athanassakos, G.: Equity Valuation: A Guide to Discounted Cash Flow and Relative Valuation Methods, Ivey School Business, 2005 or later edition.
Prerequisites	2. Handouts in class and all additional material required by the lecturer. Compulsory bachelor's level courses in finance and economics.

A220A9000	MASTER'S THESIS, STRATEGIC FINANCE	30 ECTS cr
	Master's Thesis, Strategic Finance	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 3-4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen, Professor, D.Sc. (Econ. & Bus. Adm.) Eero Pätäri, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem, Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed	
Aims	<p>Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen</p> <p>The aim of the research seminar is to support students' process of writing a thesis and conducting scientific research.</p> <p>The overall goal of the thesis, for the student, is to display the knowledge and capability required for independent work as a Master of Science in Economics and Business Administration and especially in the area of Strategic Finance. After completing the thesis, the student is expected to be able to:</p> <ul style="list-style-type: none"> - carry out a research project independently - report the research findings in written format according to scientific practices - demonstrate deeper methodological knowledge in the field of strategic finance - compare and combine information based on the relevant literature and empirical data - present and discuss conclusions and the knowledge and arguments behind them - suggest the practical implications of a specified research area on global finance 	
Content	<p>The process of writing a Master's thesis consists of five steps. 1) Introductory lecture 2) Selecting a topic and writing a short research plan 3) Research seminar I: presentation of research plan, 4) Research Seminar II: Presentation of the intermediate version of the thesis and oral and written discussion on another master's thesis, 5) Maturity test after the submission of final version. The master thesis and seminars require: finding a good topic, showing a research gap, writing a research proposal, creating a theoretical framework, the structure of the thesis, synthesizing theories, applying methodological tools, and academic writing that also includes knowledge of referencing and formatting.</p>	
Modes of Study	<p>Introductory lecture 4 h, period 3</p> <p>Written research proposal 24 h, period 3</p> <p>Seminar I: Presentation of a research proposal 4 h, period 3</p> <p>Seminar II: Presentation of the intermediate version of thesis and written and oral feedback on one other thesis 4 h, period 4</p> <p>Maturity Test 3 h, period 4</p> <p>Preparation and writing for seminars I & II, thesis and maturity test 761 h, period 3-4</p> <p>Active seminar participation (mandatory attendance in seminars)</p> <p>Total workload: 800 h</p>	
Evaluation	<p>Thesis grade: improbatum (failed) – laudatur (excellent), on the basis of a number of quality aspects of the thesis at a scale of 0-5.</p> <p>Maturity test grade: fail - pass.</p>	
Study materials	Handouts distributed in the introductory lecture and seminars.	
Prerequisites	Compulsory Master's degree courses in Strategic Finance.	

A330A0100	INTERNATIONAL BUSINESS STRATEGIES	6 ECTS cr
	<p>International Business Strategies</p> <p>The number of students attending the course may have to be limited based on a 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.</p> <p>Year and Period M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2</p> <p>Teacher(s) Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen</p> <p>Aims The aim of the course is to familiarize 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. After completing the course the students should be able to:</p> <ul style="list-style-type: none"> • analyse technology intensive international marketing environment, and to generate and carry out properly justified international business strategies. • decompose the corporate strategy into functional strategies (e.g. marketing or production strategy), and to coordinate and critically evaluate the implemented strategies, by interpreting key financial indicators of performance; • plan, communicate, and carry out a group research project applied to a firm in a simulation, • work in a multi-cultural team; • be able to interpret new information critically and systematically and be able to develop ideas and projects based on this information; • be able to apply knowledge gained from the course, in addition to that provided by additional reading, analysis and discussion, to the events, activities and/or strategies of an actual firm or organisation. • participate in discussion on topics of international business interest, and to stimulate and answer questions from a knowledgeable audience; <p>Content develop a mindset that fosters sustainability, and global, market and technology orientation in a global business environment The skills and application of critical inquiry into your reading, discussions, and situations and experiences that you encounter with regard to international business, both inside and outside the classroom setting. The international business planning process and its content especially related to international marketing. International and global business strategies. Strategic tools for analyzing the internal and external environment, for example resource and product positions. Organization of resources, capabilities and knowledge within a multinational corporation. Implementation methods of an international business strategy. International finance, international HRM, international production and sourcing strategies, corporate social responsibility. OLI paradigm, institutional theory, international technology strategy, real-life firm strategy examples (provided by a guest lecturer).</p> <p>Modes of Study 18 h of interactive lectures, 1st period. 10 h of interactive lectures, 2nd period. Group assignment/project work based on simulation exercises in international groups (incorporating online simulation and written group assignments: a strategic plan and a reflective report) 97 h Mid-term tutorial (each group independently with tutors) 1 h Preparation for lectures and exam 34 h Written exam.</p>	

Evaluation	Total course 160 h. Final grade 0-5. Evaluation 0-100 points: Active class participation Assignment(s): oral and written project work in groups, 70 points Exam, 30 points
Study materials	All assignments (including the exam) must be passed. Lasserre, P: (2007). Global Strategic Management. Peng, M.W. (2006). Global Strategy (or a newer 2nd edition). Assigned reading (collection of articles). Guide manual for the simulation.
Prerequisites	Slides from the lectures. AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing

A350A0050	BUSINESS RESEARCH METHODS	6 ECTS cr
Year and Period	Business Research Methods	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2 Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Paavo Ritala	
Aims	After completing the course, the students are able to - understand the basic concepts of philosophy of science and research - understand the specific features of qualitative and quantitative research - define and plan research objectives and choose the research approach based on those objectives - apply focal methods of qualitative and quantitative research on gathering and analysis of empirical material - report the methods and research results related to qualitative and quantitative research - analyze the quality, reliability and validity of qualitative and quantitative research	
Content	Basic principles of philosophy of science, The objectives of doing research, Research process, Choice of research methods, The specific features of qualitative and quantitative research, Data gathering, methods, analysis and reporting, Analysis of the quality of research.	
Modes of Study	Combining the qualitative and quantitative research approaches. Lectures 27 h, independent reading assignments and preparation for lectures 24 h Exercises on quantitative data gathering and analysis 9 h Written exam and preparation for exam 60 h Total workload for student 160 h Blackboard in use	
Evaluation	Grading 0-5, evaluation 0-100 points Learning assingments in groups 50 points Written exam 50 points	
Study materials	Both assingments and exam must be passed with acceptable evaluation. Lecture slides Saunders, M, Lewis, P. and Thornhill, A. (2009). Research methods for business students, 5th ed., FT/Prentice Hall.	

A350A0100	CONSULTING PROJECT AT LUT	6 ECTS cr
	Consulting Project at LUT	
	The maximum amount of participants is 25. Preference is given to MITIM and MIMM students and after that to Master's Students of LUT School of Business. In the possible selection of students, attention will be given to getting a versatile group from different areas of specializations.	

Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4
Teacher(s)	Adjunct Professor, D.Sc (Econ.), Lic. Pol. Sc Timo Santalainen Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	<p>Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio</p> <p>By the end of the course the students will</p> <ol style="list-style-type: none"> 1. Master key strategic concepts, tools and frameworks for strategizing. 2. Recognize the roles, styles and practices of strategy consulting in different situations. 3. Be able to apply strategic concepts, tools and frameworks in solving the consulting case problem. 4. Be able to outline a professional written report based on the results of their analysis and contributions. 5. Be able to communicate their findings and recommendations in a convincing, professional way.
Content	<p>Consulting Project at LUT is focused on strategy consulting with a very hands-on approach to learning: students take the role of strategy consultants to solve a case organization's concrete problem. The course and its ways of working are designed to help participants to explore strategic issues of selected companies/organizations from three perspectives: academic research and concepts (A), business practice (B), and consulting (C). Taking the role of strategy consultants participants are expected to develop value-generating ideas for their respective case organizations.</p> <p>The course is also aimed at the development of business "softskills" such as teamwork, leadership, project management, presentation and other communication skills.</p> <p>Core content:</p> <p>Evolving motivations and approaches in strategic management and thinking within the context of (hyper)competitive multinational business arenas.</p> <p>Conceptual tools for strategic situational analysis.</p> <p>The logic of developing customer-centric and resource-based strategies as well as value-capturing business models.</p> <p>Alternative roles, styles and practices of strategy consulting.</p> <p>Additional content:</p> <p>Alternative modes and tools of "strategizing" in case- as well as in real business situations.</p> <p>Information collection and problem solving skills.</p> <p>Effective presentation skills.</p>
Modes of Study	<p>Prework: Reflective essay: appr. 30 h (reading and preparation of the essay)</p> <p>16 hours of lectures (Kick-off workshop, attendance compulsory)</p> <p>16 hours of seminars, including final presentations of the projects to the evaluation committee</p> <p>Independent project work in teams: 90 h (finding literature, group meetings, Information gathering, analysis, writing the report)</p> <p>Written final report, presentation of the project work (preparation 8 h)</p> <p>Total student workload: 160 h</p>
Evaluation	<p>Grade 0-5, evaluation 0-100 points. Max 100 points from project work.</p> <p>Grading of projects:</p> <p>30% case company</p> <p>20% academic advisors</p> <p>50% evaluation committee</p>
Study materials	<p>Santalainen, Timo (2006) Strategic Thinking, Talentum</p> <p>Handout materials relating to topics of each seminar</p> <p>Strategy consulting tools</p> <p>Other material depending on the project work</p>

A350A0150	CORPORATE STRATEGY FOR EMERGING MARKETS 6 ECTS cr
	Corporate Strategy for Emerging Markets
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 3
Teacher(s)	Visiting professor Andrei Panibratov, GSOM St. Petersburg State University
Aims	Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	The learning outcomes of the course are the following:
Aims	- to analyze how MNCs develop strategy for an emerging economy (Finnish firms in Russia as a core example);
Aims	- to examine why and how companies from less developed countries compete internationally;
Aims	- to assess how emerging markets' companies organize their resources and capabilities to achieve competitive success in international context;
Aims	- to outline what specific managerial approaches Russian companies use when entering and organizing activities in foreign countries.
Content	Must know:
Content	Internationalization: emerging market perspective;
Content	Developing coordination and control for emerging markets;
Content	Inward and outward FDI in emerging economies;
Content	The rise of emerging markets' multinationals;
Content	Strategic choices for emerging MNCs;
Content	Core content:
Content	- Course subject and terminology.
Content	- Internationalization: emerging market perspective.
Content	- Developing coordination and control for emerging market.
Content	- Emerging economy: inward and outward FDI.
Content	- The rise of emerging markets' multinationals.
Content	- Strategic choice for emerging MNCs.
Content	- Evolution of Russian multinationals.
Content	- Organizational challenges and boundaries of Russian firms abroad.
Content	- Russian MNCs international strategies.
Content	Additional content:
Content	- Globalization of markets and internationalization of firms.
Content	- Approaches to foreign market entry. Greenfield and M&A.
Content	- Inward and outward perspective of internationalization.
Content	- Knowledge flows within multinational corporations.
Content	- Strategy for less developed economies: lessons from global firms.
Content	- The evolution of the organizational landscape in emerging economies.
Content	- The determinants of MNC activity in emerging economy.
Content	- Configurations of strategy and structure in MNC subsidiaries.
Content	- Investment decisions for emerging markets.
Content	- Factors of MNC's success in Russia.
Content	- Partnerships and strategic alliances for Russian markets
Content	- Joint ventures. Building successful partnerships in Russia.
Content	- The phenomenon of emerging multinationals.
Content	- Russian MNCs: entry strategies and post entry operations.
Content	- Natural resource and technology as alternative orientations of Russian MNCs.
Content	Special content:
Content	- the peculiarity of the strategy development for the emerging economy
Content	- the process of building the structure and strategy of Finnish firms in Russia, and the boundaries of MNC
Content	- specifics of investments to and from emerging economy, and motives and perspectives of inward and outward FDI
Content	- terminology and concepts of emerging firms' internationalization, the difference between 'global' and 'multinational'
Content	- strategic choice of MNC when internationalizing operations, and how to carry out the analysis the MNC environment
Content	- features of EMNC international strategies, and peculiarities of Russian firms'

Modes of Study	<p>entry to foreign markets - the most important principles of international strategies of internationalizing firms with the focus to the Russian companies 45 h of lectures in the 3rd period Case studies and project work In- and out-class assignments Active participation Total student workload 160 h, out of which 115 hours is spent out-class (preparation for assignments, case studies and project work)</p>
Evaluation	<p>Final grade 0–5, evaluation 0–100 points. In-class activity 30 % Midterm assignment 30% Course project in study group 40%</p>
Study materials	<p>Basic reading Bartlett C.A., Ghoshal S., Beamish P.W. Transnational Management: Text, Cases, and Readings in Cross-Border Management, 5th ed., Irwin / McGraw-Hill, Boston (Mass), 2008 Larcon J.-P. Chinese Multinationals, World Scientific Publishing Co, 2009 Ramamurti, R., Singh, J.V. Emerging Multinationals in Emerging Markets, Cambridge University Press, 2009 Cases to be available prior the course: Brazilian multinationals: Vale, Petrobras, Embraer. Chinese multinationals: Bird, Haier, and TLC. Finnair: Re-Discover Russian Market. KGK goes to Brazil Nokian Tyres in Russia. Skanska: Leaving Russian Market – Failure or Part of the Strategy? YIT in Russia. Cases to be distributed and discussed within the course: Lukoil mini case Nordea vs Alfa Bank Fortum vs Gasprom Other required reading: Clercq, D., Sapienza, H.J. Crijns, H. The Internationalization of Small and Medium-Sized Firms, Small Business Economics, 2005, 24: 409-419. Cuervo-Cazurra, A., Genc, M. Transforming Disadvantages into Advantages: Developing Countries MNEs in the Least Developed Countries, Journal of International Business Studies, 2008, 39: 957-979. Dong, B., Zou, Sh., Taylor, Ch.R. Factors That Influence Multinational Corporations' Control of Their Operations in Foreign Markets: An Empirical Investigation, Journal of International Marketing, 2008, 16(1): 98-119. Filippov, S. Think Tank: Emerging into Europe. Foreign Direct Investments. London: Apr/May 2009. Freeman, S., Cavusgil, S.T. Toward a Typology of Commitment States Among Managers of Born-Global Firms: A Study of Accelerated Internationalization, Journal of International Marketing, 2007, 15(4): 1-40. Luo, Y., Tung, R.L. International Expansion of Emerging Market Enterprises: A Springboard Perspective, Journal of International Business Studies, 2007, 38: 481-498. Panibratov, A. Internationalization Process of Russian Construction Industry: Inward Investments Perspective, Journal for East European Management Studies, 2009, 2: 210-228. Panibratov, A. Russian Multinationals: Entry Strategies and Post-Entry Operations, Electronic Publications of Pan-European Institute, Turku School of Economics, Finland, 2010, 15. Panibratov, A., Kalotay, K. Russian Outward FDI and its Policy Context, Vale Columbia Center on Sustainable International Investment, Columbia University, 1, October 13, 2009. Ramamurti, R. What have we learned about emerging-market MNEs? in Ramamurti, R., Singh, J.V., Emerging Multinationals in Emerging Markets, Cambridge University Press, 2009.</p>

	Zhanming, J. Corporate Strategies of Chinese Multinationals, in Larcon J.-P. Chinese Multinationals, World Scientific Publishing Co, 2009: 1-29. Zuohao, H., Gao, W. International Marketing Strategies of Chinese Multinationals: The Experience of Bird, Haier, and TLC, in Larcon J.-P. Chinese Multinationals, World Scientific Publishing Co, 2009: 99-126.	
A350A0200	INTRODUCTION TO ECONOMICS	6 ECTS cr
	Introduction to Economics	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1	
Teacher(s)	Associate Professor, Ph.D. Jorma Sappinen, Professor, D.Sc. (Econ. & Bus. Adm.) Kalevi Kyläheiko, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen	
Aims	By the end of the course, students will be able to describe the principles of modern market economy. Students will be able to explain the basic concepts of microeconomics and macroeconomics and can apply models of consumer, firm, markets and economy in simple situations. In addition, students can analyse the role and consequences of monetary and fiscal policy.	
Content	Principles of microeconomics and macroeconomics. Demand, supply and market equilibrium, production and markets for the factors of production, economics of the public sector. Economic growth, unemployment, inflation, economic fluctuations, monetary and fiscal policy.	
Modes of Study	Web course. Independent preparation for Blackboard assignments and Blackboard assignments 160 h. Total workload for student 160 h.	
Evaluation	Grade 0-5, evaluation 0-100 points, Blackboard-assignments 100%	
Study materials	1. Mankiw, N.G. - Taylor, M.P.: Economics, 1st ed. or older edition of the same book Mankiw, N.G.: Principles of Economics, 3rd ed. 2. Collection of articles	
A350A0250	MULTIVARIATE AND ECONOMETRIC ANALYSIS METHODS	6 ECTS cr
	Multivariate and Econometric Analysis Methods	
	Course is suitable for postgraduate studies.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Kaisu Puumalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen	
Aims	The aim of the course is to give extensive general knowledge about the main econometric and multivariate analysis methods. After completion of the course students: - understand the role of multivariate analysis in scientific research - can evaluate and compare the applicability of various multivariate methods - are able to estimate collect numerical data about the market environment in different countries - can apply multivariate analysis methods for cross-sectional, panel and time series data - can conduct the analyses with SAS software - can interpret and evaluate the results of the analyses - can report the results according to good scientific practice General aim of the course is to improve following personal skills of the students: - written and oral communication - group work skills in a multicultural team context - problem solving and project management skills	
Content	Measure development and factor analysis, cluster analysis, linear regression, linear models, logistic regression, autocorrelation, stationarity, panel data regression	

212 Business Administration

Modes of Study	Use of SAS software, use of international databases of statistical data. Special features of countries. Lectures 21 h, exercises 21 h, independent data collection and analysis using the SAS software 55 h, 3rd period. Seminar 8 h, independent analysis, writing of report and preparing for presentation 55 h, 4th period. Total workload for student 160 h.
Evaluation	Final grade 0-5, evaluation 0–100 points, written report 75%, oral 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

6.4. Student Assessment Policy

Approved by the faculty council 16 March 2010

Changes approved by Head of Degree Programmes 30 April 2011

General assessment principles

The key purposes of assessment

- To monitor student attainment of learning outcomes
- To provide both students and teachers with feedback on the quality of learning
- To control compliance with the developing standards of higher education
- To motivate students in their studies

Objectives of the student assessment policies

- Be equal
 - Requirements are equal across courses and programmes
 - No discrimination based on gender, sexual orientation, ethnicity, religion, belief, age, class or disability
- Be transparent
 - Students understand how they are assessed
 - Students understand how they can influence their grades
- Be coherent
 - Assessment is in line with the intended learning outcomes of the courses
 - Assessment should appropriately reflect the level of the programme
- Be educational
 - Foster student efforts towards the intended learning outcomes
 - Be an integral part of the curriculum and the learning process → support student learning

Practices to support the objectives of student assessment

An equal assessment policy

- All courses are assessed on a universal grading scale of 100 points
- The appropriateness of the assessment systems for individual courses is checked *ex ante*
- The assessment is as objective (e.g. evaluation rubric) as possible with minimal subjectivity
- The grade distributions are monitored
- The appropriateness of pass rates and progression are monitored
- School level policies regarding deadlines, retakes and resits are implemented
- The appropriateness of marking and grading standards is checked *ex post* (min. 20% of exams)*

→ The objective is to increase the *ex post* checking of marking

→ The objective is to develop practices to enable anonymous marking of exams

* Practice will be piloted by the Master's programme of International Marketing

A transparent assessment policy

- Clear assessment criteria and weighting of components
- The use of an evaluation rubric is strongly encouraged
- Students are informed of the assessment system (and related rubric) of each course during the introductory lectures
- Material explaining the assessment policies is also available online
- Explicit school level policy with regard of deadlines, re-takes, re-sits and appeals

A coherent assessment policy

- The appropriateness of the assessment systems of individual courses is checked *ex ante*
 - Balance with theory and practice
 - Facilitates deep learning (timing and amount of assessment)
 - No excessive or unnecessary assessment

- Workload in line with the course scope

An educational assessment policy

- Assessment methods are in line with the intended learning outcomes
- A varied range of assessment methods is employed on the course and programme levels to support different ways of learning
- Constructive feedback is provided in addition to the grades to support the personal development of the students (especially at the Master's level)
- Peer assessment, when appropriate, is encouraged to provide rapid feedback and promote the understanding of the assessment criteria

→ The objective is to increase the feedback on exams and other forms of student output to support personal development

Course and examination evaluation scale

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. In the five-point scale where 100 points is the maximum, grade 5 requires 90–100, grade 4 requires 80–89, grade 3 requires 70–79, grade 2 requires 60–69, grade 1 requires 50–59 and grade 0 requires 0–49.

The possible coursework affects the final grade of the course together with the possible examination. The teacher determines how much the coursework is emphasised in the evaluation. Teachers shall forward the grades to the Student Affairs Office and make them known to the students or post them online within a month, but no later than two weeks before the following examination. If two of the exams for a course are held within a four-week period, the teacher may grade all of the exams at once. In such cases, the one-month period for grading exams starts from the latter exam.

General assessment policies

The timeliness of assessment

- All exams and other forms of student output are assessed within the period of one month

Extension of deadlines and late submission of student work

- Course deadlines will not be postponed without a clear and acceptable reason (e.g. teacher's illness)
- In the case of a clear and acceptable reason (e.g. illness, death of a close relative), students should contact the teacher responsible in advance and agree on the extension of the deadlines. In these cases, there will be no sanctions
- Student work submitted after a set deadline will not be assessed/accepted, unless agreed with the teacher responsible in advance
- Work-related reasons are not acceptable for extending the deadlines for an individual student

Retakes and resits

- Students have the possibility to retake an exam once (four exams will be organised and the student must choose which two he/she takes).
- In the case the student does not pass the exam during the two possible exams, he or she may apply for an additional retake according to LUT practise.
- It is not possible to retake an assignment that has already been accepted (except an exam)
- When the student fails to pass an obligatory assignment, he/she has the possibility to retake that assignment the following year.
- The grade of an assignment that has been assessed and accepted, will be effective for a period of two years. After the two year period, the student needs to resit the course.
- Only in cases where the resit would postpone the graduation of the student (an ongoing Master's thesis process), he/she will be allowed e.g. to retake a failed assignment. This needs to be agreed on with the teacher responsible. It is the student's responsibility to prove that he/she will graduate soon (max. 1 course is missing and the thesis process is advanced) by submitting a transcript and personal study plan.

Plagiarism

- Various systems to check for plagiarism are used
- When a student has been noted to have submitted a thesis including a substantial amount of plagiarism, he/she needs to write a new thesis on a new topic
- When a student has been noted to have submitted an assignment including a substantial amount of plagiarism, he/she needs to write a new assignment on a new topic
- On the basis of the nature of the assignment, the teacher responsible will determine the amount of plagiarism that requires sanctions and starting the process of disciplinary measures

Correction of the assessment

- Students have the right to obtain information on the assessment criteria applied to them. After the assessment, students have the right to receive a duplicate of the paper assessed
- Students dissatisfied with the assessment of a course-related assignment other than a final thesis may orally or in writing request a correction within 14 days of the publication of the assessment results
- The request shall be made to the instructor of the course and to the head of study affairs, or in the case of a Master's thesis, in writing to the faculty council (head of study affairs)
- Students who are dissatisfied with the decision may bring the matter to the degree board within 14 days of having been informed of the decision. The decision of the degree board is final; no appeals can be made
- The rector nominates the members of the degree board (the Student Union nominates student member(s))

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 2011

August 29 – December 16

1st period/August 29 - October 21

2nd period/October 23 - December 16

Orientation Days, August 24-26

Subject to alterations

<i>Course number, Course</i>	<i>ECTS cr</i>
A210A0050	6
A220A0150	6
A330A0100	6
A330A0150	6
A330A0200	6
A330A0250	6
A330A0300	6
A340A0100	6
A350A0200	6
A350A0300	6
A370A6000	5
A380A0000	6
A380A6050	3
A390A0450	6
CS10A0260	5
CS10A0550	7
CS10A0800	5
CS10A7000	3
CS30A1551	5
CS30A7000	3
CS30A7200	3
CS34A0400	5
FV18A9900	2

A210A0050	COMPARATIVE INTERNATIONAL ACCOUNTING: THEORY AND PRACTICE	6 ECTS cr
	Comparative International Accounting: Theory and Practice	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed, N. N.	
Aims	At the end of the course a student is expected to be able to: -compare and analyze accounting practices and quality of accounting information in different parts of the world -assess the international harmonization of accounting standards -analyze the impact of different social, financial, legal and taxation systems on accounting -interpret the practical implications of international differences in accounting -develop the communication and social skills through working in multi-cultural groups for term paper and presentation	
Content	The course is focused on international differences in accounting practices and quality of reported information associated with various social, legal and taxation systems. The harmonization of accounting standards and the practical implications of differences in accounting systems.	
Modes of Study	Lectures: 24 h, period 1 Preparation for lectures and exam: 104 h, period 1-2 Term paper writing and presentation preparation: 28 h, period 1-2 Seminars: 4 h, period 2 Total workload: 160 h. Blackboard in use.	
Evaluation	Grade 0-5, evaluation on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both. Bonus points for active class participation.	
Study materials	1. Nobes and Parker: Comparative International Accounting, 2006 or later edition. 2. Handouts in the class and all additional material required by the lecturers.	
Prerequisites	Compulsory bachelor's level courses in accounting and finance.	
A220A0150	INTERNATIONAL FINANCE AND EMERGING MARKETS	6 ECTS cr
	International Finance and Emerging Markets	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem, visiting lecturers	
Aims	At the end of the course the student is expected to know: - how the theory of international trade and finance is formed; - the basic relations in international asset pricing; - the specifics in Russian financial markets: stock, bond, money and derivative markets; - the specifics in corporate governance, privatization and corporate finance in Russia; - the latest issues in empirical financial research on the Russian market; - the special characteristics of other emerging markets: BRIC countries, Frontier emerging markets, the Emerging Europe and the Middle East; - what are the different sources of risks involved in emerging markets; - different episodes of financial crisis	

Content	The course is designed to give advanced-level (Master) knowledge of International Finance and Emerging Markets. The course covers five different areas in International Finance and Emerging Markets: 1) international trade and finance, 2) international asset pricing, 3) multinational finance, 4) special characteristics of emerging financial markets, 5) different episodes of financial crisis.
Modes of Study	Lectures: 30 h, period 2 Preparation for lectures and exam: 94 h, period 2 term paper: 36 h, period 2 Total workload: 160 h Blackboard in use.
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and home assignments (20%). Students are required to achieve 50 percent of the maximum points in both.
Study materials	Bonus points for active class participation. 1. Eiteman, Stonehill, and Moffett: "Multinational Business Finance". Pearson International, 2007, 11th edition. Selected parts. 2. Research articles 3. Handouts in class and all additional material required by the lecturer
Prerequisites	Compulsory bachelor's level courses in finance and economics.

A330A0100	INTERNATIONAL BUSINESS STRATEGIES	6 ECTS cr
	International Business Strategies	
	The number of students attending the course may have to be limited based on a 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.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen	
Aims	<p>The aim of the course is to familiarize 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;</p> <p>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.</p> <p>After completing the course the students should be able to:</p> <ul style="list-style-type: none"> • analyse technology intensive international marketing environment, and to generate and carry out properly justified international business strategies. • decompose the corporate strategy into functional strategies (e.g. marketing or production strategy), and to coordinate and critically evaluate the implemented strategies, by interpreting key financial indicators of performance; • plan, communicate, and carry out a group research project applied to a firm in a simulation, • work in a multi-cultural team; • be able to interpret new information critically and systematically and be able to develop ideas and projects based on this information; • be able to apply knowledge gained from the course, in addition to that provided by additional reading, analysis and discussion, to the events, activities and/or strategies of an actual firm or organisation. • participate in discussion on topics of international business interest, and to stimulate and answer questions from a knowledgeable audience; <p>develop a mindset that fosters sustainability, and global, market and technology orientation in a global business environment</p>	

Content	The skills and application of critical inquiry into your reading, discussions, and situations and experiences that you encounter with regard to international business, both inside and outside the classroom setting. The international business planning process and its content especially related to international marketing. International and global business strategies. Strategic tools for analyzing the internal and external environment, for example resource and product positions. Organization of resources, capabilities and knowledge within a multinational corporation. Implementation methods of an international business strategy. International finance, international HRM, international production and sourcing strategies, corporate social responsibility. OLI paradigm, institutional theory, international technology strategy, real-life firm strategy examples (provided by a guest lecturer).
Modes of Study	18 h of interactive lectures, 1st period. 10 h of interactive lectures, 2nd period. Group assignment/project work based on simulation exercises in international groups (incorporating online simulation and written group assignments: a strategic plan and a reflective report) 97 h Mid-term tutorial (each group independently with tutors) 1 h Preparation for lectures and exam 34 h Written exam. Total course 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: Active class participation Assignment(s): oral and written project work in groups, 70 points Exam, 30 points
Study materials	All assignments (including the exam) must be passed. Lasserre, P: (2007). Global Strategic Management. Peng, M.W. (2006). Global Strategy (or a newer 2nd edition). Assigned reading (collection of articles). Guide manual for the simulation.
Prerequisites	Slides from the lectures. AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing

A330A0150	INTERNATIONAL ENTREPRENEURSHIP	6 ECTS cr
Year and Period	International Entrepreneurship	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2 Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo, Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen	
Aims	The learning outcomes of the course are the following: 1. to be able to analyze the processes of international entrepreneurship both from theoretical and practical standpoints. 2. to be able to evaluate the main characteristics of successful international entrepreneurs. 3. to be able to outline the nature, benefits and drawbacks of an international expansion strategy in entrepreneurial firms. 4. to be able to assess the actual opportunities and challenges that entrepreneurs have to deal with when internationalizing their businesses. 5. to be able to evaluate the variety of international marketing strategies available to organizations in a range of environmental contexts. 6. to be able to develop internationalization plan 7. to be able to apply the knowledge on entrepreneurial firm internationalization in knowledge and technology-intensive environments 8. To be able to collaborate in cross-cultural teams 9. To be able to design and deliver various kinds of presentations focusing on	

Content	international entrepreneurship and marketing for a corporate audience Evolution of international entrepreneurship as a field of study, 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, tools and frameworks in analysis of a particular international entrepreneurial opportunity and creation of a business plan. Characteristics of successful international entrepreneurs, specific features of knowledge-intensive, high tech and software industries.
Modes of Study	9 hours of lectures 3 hours of case narrative presentations 12 hours of field project presentations 0,5 hours of group tutorials 26 hours of preparation for lectures 13 hours of preparation for case narrative 62 hours of preparation for field project 1,5 hours of preparation for group tutorial 7 hours of preparation for field project presentation 26 hours of preparation for oral group exam and exam Total course 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: Active class and tutorial participation Assignment 1: Case narrative of chosen firm/ entrepreneur (10 points) Assignment 2: Field project & Presentation (50 points) (Peer evaluation in the group work has an effect on the grade) Oral group examination (40 points)
Study materials	All assignments must be passed to acquire the final grade. 1. Äijö Toivo, Kuivalainen Olli, Saarenketo Sami, Lindqvist Jani & Hanninen Hanna (2005) Internationalization Handbook for the Software Business, Centre of Expertise for Software Product Business, Espoo 2005. 2. Hisrich Robert D. (2009) International Entrepreneurship – Starting, Developing, and Managing a Global Venture, SAGE Publications. 3. Additional reading and material assigned in class.
Prerequisites	AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing

A330A0200	INTERNATIONAL MARKETING OF HIGH TECHNOLOGY PRODUCTS AND INNOVATIONS	6 ECTS cr
Year and Period	International Marketing of High Technology Products and Innovations	
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 2, Period 1 Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, Professor, Ph.D Sanjit Sengupta	
Aims	After the course, student should be able to: 1. interpret and analyze external high technology environments (e.g. relating to competitive landscape, consumer behavior, markets) in global scale 2. distinguish the special characteristics of high technology marketing environment (like the type of innovation, market and technology uncertainties, network externalities) and evaluate marketing management strategies in such environments 3. apply and develop transferable intellectual skills (like theory application, problem solving, information acquisition, analytical, communications, social and intercultural competence). Course aims to provide a deep understanding of the functions of marketing regarding challenges and opportunities in high technology products and	

Content	markets; assist the participants to understand the virtue and limitations of traditional marketing thinking and tools in emergent high technology markets. Contingency model of high technology marketing, Special characteristics of technology intensive markets, How to apply marketing tools in high technology companies.
Modes of Study	Industry evolution, innovation typologies, entry strategies, technology maps, technology paradox in pricing, launch strategies, innovation adoption and diffusion. Lectures, assignments, exam. In-class hours: 12 hours of lectures (2 h/week during 6 weeks) 20 hours of seminars (4h/week during 5 weeks) 3 hours of business case presentations Total in-class: 35 hours Out-class hours: 24 hours of exam preparation 5 hours for preparing for lectures 78 hours for doing assignments 5 hours for preparing presentation 13 hours for solving and presenting business case Total out-class: 125 hours Exam: 3 hours Total workload for student 160 h.
Evaluation	Blackboard in use. Final grade 0-5. Evaluation 0-100 points: Exam (30 points) Assignments (groupwork) (50 points). NOTE: Peer evaluation of the group work may effect on the grade. Presentation (10 points) Business case (10 points). All assignments except the business case which is voluntary must be passed to acquire a final grade.
Study materials	1. Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2010) Marketing of High-Technology Products and Innovations. Third Edition. Pearson Prentice Hall. 2. Assigned reading.
Prerequisites	AC40A0900 Strategic Global Marketing Management or A330A0300 Strategic Global Marketing Management, AC60A0600 Tehcnology and Innovation Management or A350A0300 Technology and Innovation Management, AC40A0202 Internationalization of the Firm and Global Marketing or A330A0250 Internationalization of the Firm and Global Marketing

A330A0250	<i>INTERNATIONALIZATION OF THE FIRM AND GLOBAL MARKETING</i> 6 ECTS cr
Year and Period	Internationalization of the Firm and Global Marketing
Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1, Period 2 Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo
Aims	After completing the course the student will understand the processes of firm internationalization and global marketing. The learning outcomes of the course are the following: 1. To recognize the characteristics of the international market environment 2. To assess and criticize the essential theories and frameworks of firm internationalization. 3. To analyze the key management decisions connected with the internationalization of the firm and global marketing: Whether to internationalize, deciding which markets to enter, deciding how to enter the foreign market, designing the global marketing programme. 4. To be able to collaborate in cross-cultural teams 5. To create and deliver a group presentation focusing on the mentioned

Content	internationalization decisions in a given Finnish company. Chain of strategic decisions related to internationalization of the firm and global marketing, internationalization motives and barriers, Internationalization theories (Uppsala model, Network approach, Born Global), international market selection process, factors influencing entry mode choice, characteristics of various entry modes (export modes, intermediate entry modes, hierarchical modes), designing the global marketing programme. Concept of value chain in internationalization, comparison of SMEs and LSEs in internationalization and global marketing, environmental analysis in deciding which market to enter (political, economic, sociocultural, and technological environment).
Modes of Study	Principles of transaction cost analysis. 21 hours of lectures with interactive mini-case studies, 2nd period. 14 hours of exercises including case study and group assignment (written report and class presentations), 2nd period. 4 hours of preparation for case exercise, 25 hours of preparation and writing for group assignment, 5 hours of preparation for group presentation, 88 hours of preparation for lectures and exam, 3 hours of writing the exam Total course 160 h.
Evaluation	Final grade 0-5. Evaluation 0-100 points: written exam 70 points group assignment 30 points casework passed/failed.
Study materials	All assignments must be passed to acquire the final grade. 1. Hollensen, S. (2007) Global Marketing – A decision-oriented approach (older editions apply as well), Prentice Hall. 2. Welch, L. Benito, G., and Petersen, B. (2008) Foreign operation methods: Theory, analysis, strategy, Edward Elgar Publishing. 3. Additional reading and material assigned in class.
Prerequisites	Basic knowledge of international marketing.

A330A0300	STRATEGIC GLOBAL MARKETING MANAGEMENT	6 ECTS cr
	Strategic Global Marketing Management	
Year and Period Teacher(s)	M.Sc. (Econ. & Bus. Adm.) 1, Period 1 Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen, Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen	
Aims	Person in Charge: Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen After taking the course the students should to be able to: 1. identify the underlying concepts and theoretical perspectives of marketing management strategy, 2. assess firm's internal and external environments from strategic marketing management perspective 3. describe and assess the range of marketing strategies available to organizations in a range of environmental contexts 4. describe and assess marketing programmes 5. understand the basics in marketing performance measurement 6. develop a marketing plan 7. design and deliver a professional presentation of a marketing plan. After completing the course student will be able to: identify the underlying concepts and theoretical perspectives of marketing management strategy; explain the scope and the role of strategic global marketing analysis, formulation, choice, evaluation and implementation; evaluate the marketing strategies of global organizations and assess how the marketing strategies adopted in particular organizations have contributed to organizational performance;	

Content	describe and assess the range of marketing strategies available to organizations in a range of environmental contexts; assess strategic options that will be responsive to changes facing a business; identify and assess the strategies based on sustainable competitive advantage; develop a global mindset in marketing management. Assessment of the competitiveness of the firm, assessment of the external marketing situation, STP-process, developing marketing strategies and programmes, standardization versus adaptation, relationships in value chain, budgeting, controlling, marketing plan, marketing performance measurement.
Modes of Study	Corporate social responsibility strategy, customer behavior, customer relationship management. Lectures, 4 assignments, workshop, seminar, exam. In-class (36 hours): 2 hour introductory lecture 4 hour workshop 20 hours of lectures 10 hours of term paper presentations in a seminar meeting Out-class (124 hours): 10 hours for lecture preparation 42 hours for exam preparation 24 hours for preparing assignments 43 hours for preparing term paper 5 hours for preparing a presentation Course total: 160 hours
Evaluation	Blackboard in use. Final grade 0-5. Evaluation 0-100 points: Assignments 1-3 passed/failed. Assignment 4 (i.e. term paper, a groupwork) (40 points). Presentation of term paper (10 points). Exam (50 points).
Study materials	All assignments must be passed to acquire the final grade. . Hollensen, Svend (2010) Marketing Management. A Relationship Approach. Second Edition. FT Prentice Hall.
Prerequisites	2. Assigned readings. Basics in Marketing.

A340A0100	ORGANIZATIONAL LEARNING IN KNOWLEDGE MANAGEMENT	6 ECTS cr
	Organizational Learning in Knowledge Management	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2	
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Jianzhong Janne Hong	
Aims	By the end of the course, students will be able to: familiarize themselves with the state of the art literature on the studied subject; identify basic concepts, functioning principles and enabling tools for organizational learning in knowledge management; have first-hand virtual learning experience; apply what has been learnt to real-life cases; conduct group work actively and collaboratively .	
Content	The course consists of three parts of virtual participation and interaction: 1) active participation in individual literature study (e.g. intensive reading of the course materials presented on the web and required journal articles and book	

Modes of Study	<p>chapters), able to apply theories learnt in case analysis, 2) a case analysis and written report by group, and 3) case presentation and discussion in a virtual discussion forum. The case analysis is conducted based on the problem-based learning (PBL) method.</p> <p>Lectures 7 h, 2. period Individual preparation for the lectures 33 h Virtual group assignment 120 h Total workload 160 h.</p> <p>Reading assigned articles and writing summaries, group case analysis and discussion through the LUT virtual learning platform Blackboard.</p>
Evaluation	Grade 0-5, evaluation 0-100 points, individual literature study 30%, group work on the case analysis 70%
Study materials	<ol style="list-style-type: none"> 1. Course materials presented on Blackboard. 2. Assigned reading to be announced on the course web page.

A350A0200	INTRODUCTION TO ECONOMICS	6 ECTS cr
	Introduction to Economics	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1	
Teacher(s)	Associate Professor, Ph.D. Jorma Sappinen, Professor, D.Sc. (Econ. & Bus. Adm.) Kalevi Kyläheiko, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen	
Aims	By the end of the course, students will be able to describe the principles of modern market economy. Students will be able to explain the basic concepts of microeconomics and macroeconomics and can apply models of consumer, firm, markets and economy in simple situations. In addition, students can analyse the role and consequences of monetary and fiscal policy.	
Content	Principles of microeconomics and macroeconomics. Demand, supply and market equilibrium, production and markets for the factors of production, economics of the public sector. Economic growth, unemployment, inflation, economic fluctuations, monetary and fiscal policy.	
Modes of Study	Web course. Independent preparation for Blackboard assignments and Blackboard assignments 160 h. Total workload for student 160 h.	
Evaluation	Grade 0-5, evaluation 0-100 points, Blackboard-assignments 100%	
Study materials	<ol style="list-style-type: none"> 1. Mankiw, N.G. - Taylor, M.P.: Economics, 1st ed. or older edition of the same book Mankiw, N.G.: Principles of Economics, 3rd ed. 2. Collection of articles 	

A350A0300	TECHNOLOGY AND INNOVATION MANAGEMENT	6 ECTS cr
	Technology and Innovation Management	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1-2, Period 2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio, Professor, Ph.D. Karl-Erik Michelsen, Professor, D.Sc. (Econ. & Bus. Adm.) Aino Kianto Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	<ol style="list-style-type: none"> 1. To recognize different types and sources of innovations 2. To interpret how technology changes and how technologies and society interact 3. To characterize the key features of an innovative organization 4. To assess how firms manage both technological and business innovations 5. To analyze the evolutionary process of innovation development 6. To synthesize and critically evaluate the commonly available information 7. To reflect individual and team contribution to team innovativeness 	
Content	The course explores the concept of innovation from various points of view: What are innovations, how they are made and how they affect company's strategy and performance. In modern large scale corporations innovations are necessary instruments for growth and competitive edge. Yet, innovation process must be managed and maintained and this requires strategic thinking,	

	<p>vision and courage as well as a particular kind of organizational culture. This course explores how core technologies are created and how they are developed further to serve the needs of company business strategy. Innovativeness is based on the creativity of individual employees as well as group processes and organizational characteristics that support the creation of new knowledge. Global companies use transparent innovation process in order to facilitate to serve the customers. This course also explores how users affect innovations and what is the role of customer in innovation process. Finally, innovations are not made in isolation, but rather in a context that is affected by regional, national and trans-national innovation systems.</p> <p>After completing the course, the students know how a firm manages its R&D and creates core technologies which are bases for innovation strategy. They also know what kind of elements innovative group work and continuously renewing organizations are built upon. How the R&D is organized in-house and how it is connected to the regional, national and trans-national innovation systems.</p> <p>Core content:</p> <p>What is an innovation and how innovations are made</p> <p>Innovation typologies: e.g. incremental vs. radical/discontinuous/disruptive innovations.</p> <p>Technological and business innovations.</p> <p>Individual creativity</p> <p>How technology changes and what are the causes of change.</p> <p>The role of R&D and innovations in established firms</p> <p>The role of R&D in new start-up firms</p> <p>Innovative teams</p> <p>Organizational renewal capability</p> <p>Role of innovations in business strategy</p> <p>Process of new product development</p> <p>Commercialization of new innovations</p> <p>Technology adoption life cycle</p> <p>Additional knowledge:</p> <p>Value creation through technology partnerships and networks</p> <p>Innovations and business models</p> <p>Evaluation of team innovativeness and organizational renewal capability</p> <p>The role of customers and users in R&D process.</p> <p>Innovation, technology and growth.</p> <p>Modes of Study In-class hours: Lectures: 30 h; Seminars: 8 h Out-class hours: Preparation for term paper: 56 h; Preparation for lectures:16 h; Preparation for exam:50 h. Total student workload: 160 h Blackboard in use.</p> <p>Evaluation Final grade 0-5. Evaluation 0-100 points, written exam 60 points, term paper 40 points. All assignments must be passed to get the final grade.</p> <p>Study materials Tidd, J. & Bessant, J. (2010) Managing Innovation: Integrating Technological, Market and Organizational Change. 4th Edition. John Wiley & Sons Ltd. Selected articles.</p>
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A370A6000	ORGANIZATIONAL CULTURE AND GENDER ASPECTS IN MANAGEMENT 5 ECTS cr
	Organizational Culture and Gender Aspects in Management
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2 int.
Teacher(s)	Professor, Ph.D. Albert J. Mills, Saint Mary's University, Halifax Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Pia Heilmann
Aims	By the end of the course students will have - a working knowledge of the concept of organizational culture and its implications for workplace equity; - an in-depth understanding of gender and its influence on behaviour at work;

<p>Content</p> <p>Modes of Study</p> <p>Evaluation</p> <p>Study materials</p> <p>Prerequisites</p> <p>Further Information</p>	<ul style="list-style-type: none"> - a working knowledge of the role of management in the shaping of organizational culture and its relationship to organizational culture; - an understanding of selected methods for understanding gender and organizational culture, and - the ability to apply understandings for organizational culture and gender to selected case studies <p>Managers and other experts working in organizations need appropriate skills to work with the multiple questions related to gender equality. The course will provide students with an understanding of the interrelationships between organizational culture, management, and gendered practices at the workplace. The course focus is on how managers can identify, assess and address the organizational processes that lead to discriminatory outcomes for women and men at work. The course stresses that the cultures of organizations should be constructed to accommodate the needs of all members of the organization regardless of sex. To that end we will cover the following content:</p> <ol style="list-style-type: none"> 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 selected case studies. 5. Managing gender at work - issues and debates. <p>Intensive course during 2. period. 24 hours of lectures, case exercises and group work, with a total workload of 130 hours (including the class time of 24 hours).</p> <p>Graded 0-5; The final grade will consist of continuous assessment (60%) and a final case study/presentation (40%). Evaluation 0 – 100 points.</p> <p>Articles, book chapters and cases to be specified by the lecturers and read before the course.</p> <p>Basic courses in Human Resource Management advisable</p> <p>This course has 6-10 places for open university students. More information on the web site for open university instruction.</p>
<p>A380A0000</p>	<p>CROSS-CULTURAL ISSUES IN INTERNATIONAL BUSINESS 6 ECTS cr</p>
<p>Year and Period</p> <p>Teacher(s)</p> <p>Aims</p>	<p>Cross-Cultural Issues in International Business</p> <p>The number of attending students may have to be limited if the number of students exceeds 70. If necessary, priority is given to students and exchange students of the LUT School of Business. Replaces AC40A0101 - Cross-Cultural Marketing Strategies</p> <p>B.Sc. (Econ. & Bus. Adm.) 2, Period 2 Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Hanna Salojärvi</p> <p>The goal of the course is to give an understanding of how the cultural environment affects management in international business, and advance students' global mindset by giving conceptual tools to increase their intercultural competence.</p> <p>After completing the course the students can:</p> <ul style="list-style-type: none"> - define and categorize culture - explain the concept of time orientation - explain the concept of value orientations - remember Hofstede's and GLOBE cultural dimensions - evaluate the effects of the cultural environment on international marketing strategies

Content	<ul style="list-style-type: none"> - analyze the sources of cultural conflicts in international organizations - identify the barriers in intercultural communication - understand the role of cultural factors in managing and leading international teams <p>General aim of the course is to improve following personal skills of the students:</p> <ul style="list-style-type: none"> - managerial communication skills - group work skills - presentation skills <p>Definitions of culture, the Hofstede and GLOBE cultural dimensions, the effect of culture on leadership and management in international business The limits of globalization from the cultural perspective, cross-cultural issues in virtual teams, standardization and adaptation in international marketing Country cases of cultural differences (term paper reports)</p>
Modes of Study	21 hours of lectures with integrated exercises including case assignment and term paper assignment. Preparation for lectures 12 h, 2nd period. Writing of term paper, preparation for case study and term paper presentations, 60 h, 2nd period. Written exam and preparation for exam 67 h, 2nd period. Total workload for student 160 h.
Evaluation	Grade 0-5, evaluation 0-100 points, written exam 60 %, term paper 30 %, case assignment 10 %, all assignments must be passed to obtain final grade.
Study materials	<ol style="list-style-type: none"> 1. Broweys & Price: Understanding Cross-Cultural Management, Prentice Hall 2008. 2. Assigned readings 3. Lecture slides 4. Additional material distributed in class
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

A380A6050	INTRODUCTION TO INTERNATIONAL BUSINESS AND PLANNING	3 ECTS cr
	Introduction to International Business and Planning	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 1 int.	
Teacher(s)	D.Sc. (Econ.) Toivo S. Äijö, Top Trainers Group	
Aims	Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio Learning outcomes: To familiarize the students with the fundamentals of international business in general and strategic planning for international business in particular. To provide the students with the analytical skills required for critical evaluation of actual international business strategies.	
Modes of Study	Intensive course during 1. period. 25 hours of lectures, interactive analyses, case exercises and assignments, carried out by the student, 55 hours, total course 80 h. Written examination.	
Evaluation	Graded 0-5 on the basis of case studies 20 % and written examination 80 %, evaluation 0 – 100 points.	
Study materials	The study material will be distributed at the beginning of the lectures.	
Prerequisites	Basic course in marketing	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

A390A0450	ORGANIZATION THEORY	6 ECTS cr
	Organization Theory	
	Replaces AC30A0700 - Organisaatioteoria	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Iiro Jussila	

Aims	After taking the course a student will be familiar with fundamental perspectives to organization theory, to compare these and contrast them. The student is able to explain theory building and application. In addition, the student is able to acquire, analyze and evaluate knowledge from organization theory perspective.
Content	The background, metaphors, and perspectives of organization theory. Organization and environment. Organizational social structure. Technology. Organizational culture. The physical structure of organizations. Organizational power, control, and conflict. New directions in organization theory. Theorizing and conclusions. Research process and the generation of scientific knowledge. Dissemination and use of scientific knowledge. Scientific journals and their evaluation practices.
Modes of Study	Lectures 20 h. Pre-lecture reading of the subject to be learned (the study book), 20 h. Post-lecture recap (lecture materials + study book), 20 h. Independently written "reaction paper" about one of the main course themes. Independent literary assignment of acquiring, analyzing, and evaluating information, 20 h. Written exam and preparation for the exam, 60 h, 1. period. Total workload for the student 160 h.
Evaluation	Final grade 0–5. Evaluated on scale 0–100 points. Reaction paper 20%, Information acquiring, analysis, and evaluation assignment 20%. Examination 60%.
Study materials	1. Hatch, M. J. (1997 or more recent edition). Organization Theory: Modern, Symbolic, and Postmodern Perspectives. Oxford University Press. 2. Other course material.
Prerequisites	B.Sc. studies.

CS10A0260	MANAGING INTERNATIONAL BUSINESS	5 ECTS cr
	Managing International Business	
	The amount of participants may be limited. In this case the priority would be given to the students of Industrial Management.	
Year and Period	B.Sc. (Tech.) 3, Period 2	
Teacher(s)	Professor, D.Sc. (Tech.) Anne Jalkala Lecturer, M.Sc. (Econ. & Bus. Adm.) Daria Podmetina Person in Charge: Professor, D.Sc. (Tech.) Juha Väättänen	
Aims	Student 1. recognizes the different entry modes and is able to describe the advantages and disadvantages between the different operation methods 2. is able to describe the most well known internationalization theories and evaluate the international operations of enterprises based on these theories 3. recognizes the characteristics of international relationships and understands the key practices of global account management 4. knows the principles of building a global marketing strategy and the factors affecting it.	
Content	Entry modes in international business. Internationalization theories. Multinational Enterprises in global business. Marketing strategies. International relationships and business networks. Global account management.	
Modes of Study	Lectures 21 h, written report 40 h, course literature 40 h, self study and exam preparation 30 h. Total 131 h.	
Evaluation	0 - 5, exam 65%, written report 35%	
Study materials	Hollensen, S., 2004, Global Marketing: A Decision-oriented approach, Harlow : FT Prentice Hall.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

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	
Aims	Student is able to 1. distinguish and evaluate the advantages and disadvantages of different entry modes 2. evaluate risks and opportunities in the global markets and justify the choice of entry method for different markets.	
Content	Various trade theories and the usefulness of them in practice. Main features of international trading and business relations since the Second World War. Markets and methods to evaluate them. Modes of international operations; special attention will be paid to exporting. Contractual arrangements and foreign direct investment (FDI). Theoretical approaches which explain international factor mobility. Different currency regimes. Trade agreements between nations. Risks in international business. International financial markets. Cultural factors in international business.	
Modes of Study	Lectures 42 h, exercises 14 h, written assignments 60 h, written report 20 h, course literature 25 h, self study and exam preparation 25 h. There are two exercise groups per week for this course. Total 186 h. Blackboard is used in this course.	
Evaluation	0-5, examination 50 %, exercises 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	CS10A0260 Managing International Business	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
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	Student is able to 1. define the special characteristics of Russian business environment 2. explain the transition process from communism to market economy 3. distinguish Russian markets and society from the world economy 4. produce reliable information about Russia, its economy, society and investment opportunities 5. recognize Russia's competitive advantages and disadvantages.	
Content	Transition of Russian society and business environment. Living standard analysis. Industrial sectors and foreign direct investments. Russia's competitiveness. Economic and political integration with the world economy.	
Modes of Study	Lectures 21 h, seminar work and presentation 45 h, course literature 30 h, self study and exam preparation 30 h. Total 126 h.	
Evaluation	0-5, exam 60 %, written report 20%, presentation 20%	
Study materials	Tiusanen, T.: Russia and Foreign Direct Investment. Northern Dimension Research Centre, Publication n:o 52, Lappeenranta University of Technology 2008. Tiusanen, T.: Russia in the Global Economy. Northern Dimension Research Centre, Publication n:o 49, Lappeenranta University of Technology 2008. Lecture materials.	
Prerequisites	Additional material will be announced on lectures. 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.	

CS10A7000	THE ECONOMIES OF THE BALTIC STATES	3 ECTS cr
	The Economies of the Baltic States	
Year and Period	M.Sc. (Tech.) 1, Period 2 int.	
Teacher(s)	Professor, D.Sc. (Econ.) Alari Purju Tallinn University of Technology and Estonian Business School	
Aims	Learning outcomes: The students taking this course must know basic information about the development pattern of the Baltic States. They have to be ready to interpret the macroeconomic data on the Baltic States (economic growth, inflation, employment, interest rate, dynamics of wages and productivity) in the context of macroeconomic theory. They must have the basic knowledge on foreign trade and foreign investments in the region and must be prepared to analyze respective trends in the framework of international business and international economics theories. Also they must be prepared to analyze adjustment of the listed on stock exchange companies with the changes in the macroeconomic framework. They must be familiar with the case study method.	
Content	Economic development and structural changes in Estonia, Latvia and Lithuania. Transition to market economy. Comparison of developments with other East European countries. Business framework (tax system, labour market regulations). International indicators to characterize competitiveness of business environment (The World bank's "How to do business in 2011") Structure of foreign trade and factors which determine it (concept of absolute and comparative advantage, intra-industry trade, value chain and localization theories, clusters). 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. The Dunning's eclectic theory of FDI. Real and monetary integration with the EU. Theories of economic convergence. What are the main factors determining future development of the Baltic states?	
Modes of Study	The study course contains 16 hours of lectures and 4 hours of seminars. Students have to work independently to prepare for classes and exam during the week of intensive studies with working load of additional 20 hours. They have to prepare a case study and present this after two weeks of end of lecturing period which needs additionally 28 hours of independent work per student. The case study is a group work. The total working load of the course is 78 hours.	
Evaluation	Graded 0-5 on the basis of active class participation and a case study (60 % of grade) and a written exam (40 %).	
Study materials	<ol style="list-style-type: none"> 1. Erixon, Fredrik, 2010, "Baltic Economic Reforms: A Crises Review of Baltic Economic Policy", ECIPE Working Papers, No.04, 60 p. 2. Lumiste, Rünno, Robert Pefferly and Alari Purju, 2008, "Estonia's Economic Development: Trends, Practices, and Sources"; The Commission on Growth and Development, The World Bank, Working Paper No.25, 46 p. 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. How to do Business in 2011, 2010, The World Bank, Washington. 5. Case studies of enterprises, material http://www.hex.com/tallinn/riiga/vilnius 	
Prerequisites	Basic courses in international economics and marketing	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

CS30A1551	SYSTEM DYNAMICS AND INDUSTRIAL MANAGEMENT	5 ECTS cr
	System Dynamics and Industrial Management, Systemeidynamiikka 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	Student 1. is able to construct different systems from the main research topics of industrial management, and identifies the dynamic interconnected nature (time dependent) of the performance of these systems 2. is able to use system dynamics simulation for quantifying the behavior of different systems by using simulation elements and levels 3. identifies the situations, where system dynamics based quantitative modelling is applicable, and possibly using these skills in thesis phase (M.Sc. and D.Sc.).	
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, exercises and final seminar 14 h; Seminar work takes 52 hours of student time in a group (from one to three persons), and exam another 52 hours from student in terms of reading course literature and getting familiar with other material. Total 130 h. Course webpage could be accessed through following link: http://kouvola.lut.fi/fi/tutkimus/innorail/systemdynamics	
Evaluation	0-5, exam (50 %) and seminar work (50 %).	
Study materials	<ol style="list-style-type: none"> 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.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

CS30A7000	TECHNOLOGY MANAGEMENT IN JAPAN	3 ECTS cr
	Technology Management in Japan, Teknologian johtaminen Japanissa	
Year and Period	M.Sc. (Tech.) 1, Period 1	
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 	

Modes of Study	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 Lectures 18 h, learning diary 6 h/day (24 h in total), preparation for the exam (report) 30 h. Altogether 72 h.
Evaluation	Percentage of active participation and written assignment (active participation in classes 50% and written assignment 50%).
Study materials	Written material will be distributed during lectures.
Prerequisites	Basic knowledge of production management.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

CS30A7200	GLOBAL INNOVATION NETWORKS	3 ECTS cr
	Global Innovation Networks	
Year and Period	B.Sc. (Tech.) 3, Period 1 int.	
Teacher(s)	Karol Pelc, Ph.D., Professor Michigan Technological University	
Aims	Learning outcomes: 1. How to define innovation and distinguish it from invention or discovery, and how to classify innovations 2. How to explain the open innovation approach to collaborative product development 3. How to distinguish major types of global innovation networks 4. How to calculate the transnationality index for a company 5. How to define the modules of a global project management system 6. How to evaluate an international high-tech project network organization 7. How to analyze the scope and contents of a non-disclosure agreement between partners in an innovation project 8. How to distinguish the options for intellectual property allocation in a collaborative R&D agreement	
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: 1. Schumpeterian perspective on innovation networks and basic concepts related to technological innovation 2. Global networks for knowledge generation, and collaborative practices in global product development, production, marketing and distribution 3. Strategic roadmapping and knowledge management in a global organization 4. 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 during 1. period. 20 hours of lectures and class discussions and case study workshop, 8 hours assigned written report preparation, 50 hours independent out-of class work.	
Evaluation	Graded 0-5 on the basis of case study assignment, active participation, and a written examination. The grade will be based on the following 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. LITERATURE: 1. Boutellier, R., Gassman, O., Von Zedtwitz, M., Managing Global Innovation,	

Prerequisites	Third Edition, Springer, Berlin and Heidelberg 2008.
Further Information	2. Chesbrough, H., Vanhaverbeke, W., West, J. (eds.), Open Innovation: Researching New Paradigm, Oxford University Press, Oxford and New York 2008 (paperback edition). 3. Nambisan, S., Sawhney, M., The Global Brain: Your Roadmap for Innovating Faster and Smarter in a Networked World, Wharton School Publishing, Upper Saddle River, New Jersey, 2008.
Further Information	Basic knowledge of management and economics. This course has 1-5 places for open university students. More information on the web site for open university instruction.

CS34A0400	STRATEGIC ENTREPRENEURSHIP IN AGE OF 5 ECTS cr UNCERTAINTY
Year and Period	Strategic Entrepreneurship in Age of Uncertainty, Strateginen yrittäjyys ja epävarmuuden hallinta
Teacher(s)	M.Sc. (Tech.) 2, Period 1 Professor, D.Sc. (Tech.) Marko Torkkeli
Aims	"Managing in a knowledge-based economy", "Managing by Core Competences", "Knowledge intensive firms", "Uncertainty and Change management". The latest buzz words or another passing managerial fad? Old wine in new bottles? Or perhaps, just perhaps, a fundamental means of survival and success for modern day corporations? Given the amount of effort that has been devoted to the topic by both academics and practitioners, it appears worth our while to take a deep and dispassionate look at the role of entrepreneurial thinking in sustained competitive advantage. The goal is to learn as you go and effectively convert assumptions to knowledge at a low cost. For example, via Stepping-Stone Options, "You start with small, exploratory forays into less challenging market niches and use the experiences gained there as steppingstones to build competencies in increasingly challenging and attractive market arenas that you discover as you go."
Content	Entrepreneurial thinking, uncertainty management, strategic entrepreneurship
Modes of Study	Lectures 28 h, 1. period. Journal article reading 50 h, 1. period. Seminar work writing 60 h, 1. period. Total 138 h.
Evaluation	0-5
Study materials	Lectures. McGrath Rita and MacMillan Ian, (2000). The Entrepreneurial Mindset. Harvard Business School Pr.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

FV18A9900	FINNISH SOCIETY AND CULTURE	2 ECTS cr
	Finnish Society and Culture	
Year and Period	Period 1 and 3	
Teacher(s)	N.N.	
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) and lifestyle, 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) G) Nature and Landscape (4 lectures) H) Written lecture diary
Evaluation	Pass/fail on the basis of participation 60% and a written lecture diary 40%.
Study materials	Portraying Finland. Facts and Insights. Otava 2005. (Available in the library)

Spring Semester 2012

January 9 - May 18

3rd period/January 9 - March 2

4th period/March 5 - May 18

Orientation Day, January 5

Subject to alterations

SG IBTM Spring

		<i>ECTS cr</i>
A220A0050	Financial Modeling Using Excel	6
A220A0200	International Financial Management	6
A220A0250	Managerial Finance	6
A330A0000	Contemporary Issues in International Marketing	6
A330A6010	Buyer-Seller Relationship Management	4
A350A0100	Consulting Project at LUT	6
A350A0150	Corporate Strategy for Emerging Markets	6
A350A0200	Introduction to Economics	6
A350A0250	Multivariate and Econometric Analysis Methods	6
A380A0050	Global Sourcing	6
A380A0200	Promotion and Sales Management	6
A380A6000	Cross-Cultural Encounters	3
CS10A0600	Doing Business in Transitional Economies	7
CS10A0651	Management of Innovations in Russia	5
CS10A0751	Enterprises and Competition in Russia	6
CS10A0852	European Union – Competitiveness and Enlargement	5
CS30A1500	Transportation Systems	5
CS30A1660	Open Innovation	5
CS30A7110	Management of Innovation and Technology	3
CS34A0500	Technology Commercialization and Corporate Venturing	5
FV18A9900	Finnish Society and Culture	2

A220A0050	FINANCIAL MODELING USING EXCEL	6 ECTS cr
	Financial Modeling Using Excel	
	Language of teaching is English. The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Mika Vaihekoski Person in Charge: Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed	
Aims	At the end of this course a student is expected to be able to: - apply selected financial theories and models in practice using spreadsheet programs (mainly Excel) - understand the issues involved in transforming theoretical models into practice - use Excel more fluently - write simple macro programs using the VBA - build independently, models to solve financial problems using Excel	
Content	Elective advanced studies -level course in Finance. Advanced use of Excel; building models for corporate finance, investment analysis, bond and stock pricing, portfolio management, and derivatives. Basics of Excel's Visual Basic for Applications macro language.	
Modes of Study	Lectures 21 h, period 4 (Intensive week of lectures) Preparation of lectures 29 h, period 4, Home assignments 66 h, period 4 Final Project 44 h, period 4 Total workload 160 h Blackboard in use.	
Evaluation	Graded 0-5 on the basis of home assignments (weight 60 %) and final project (weight 40 %). Students are required to achieve 50 percent of the maximum in both.	
Study materials	1. Vaihekoski, Mika: Rahoitusalan sovellukset ja Excel, WSOY, 2004 or Benninga, Simon: Financial Modeling, MIT Press, 2002 or newer. 2. Handouts in the class and all additional material required by the lecturer.	
Prerequisites	Compulsory B.Sc. courses (except Bachelor's thesis).	
A220A0200	INTERNATIONAL FINANCIAL MANAGEMENT	6 ECTS cr
	International Financial Management	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3	
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Sheraz Ahmed	
Aims	At the end of this course a student is expected to be able to: - understand the structure and functions of MNCs - analyze cross-border financing and investment decisions - evaluate the different legal environments, tax considerations and country risks involved in the financial management of MNCs - assess the impacts of exchange rates on the profitability, growth and valuation of MNCs - know the valuation and risk management strategies used by multinational corporations - measure cross-border diversification benefits in order to undertake effective risk management strategies	
Content	The course is designed to give advanced-level (Master) knowledge of multinational financial management. The course covers four different areas in international financial management: 1) currencies exchange rates risks and	

Modes of Study	valuation, 2) multinational financial decision making, 3) cross-border financing and investment diversification and 4) institutions, risk management and investors' behavior. Lectures: 24 h, period 3 Preparation for lectures and exam: 104 h, period 3 Term paper writing: 32 h, period 3 Total workload: 160 h Blackboard in use.
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both. Bonus points for active class participation.
Study materials	1. Madura and Fox: International Financial Management, 1st edition (European) 2. Handouts in class and all additional material required by the lecturer
Prerequisites	Compulsory bachelor's level courses in finance and economics.

A220A0250	MANAGERIAL FINANCE	6 ECTS cr
	Managerial Finance	
	The language of teaching is English.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Kashif Saleem	
Aims	At the end of the course, the student is expected to: - apply corporate finance theory in business strategies - compute and compare different techniques of valuing real assets; - evaluate investment decisions based on the riskiness of projects; - classify the impact of corporate taxes on asset valuation and financial decisions; - examine the affect of managerial incentives on financial decisions; - analyze the importance of risk management in corporate financial decisions.	
Content	The core contents of the course cover six different areas in corporate finance: 1) financial markets and financial instruments, 2) valuation of financial assets, 3) valuation of real assets, 4) capital structure of firms, 5) managerial Incentives, Information and corporate control in financial decisions, 6) risk management.	
Modes of Study	Lectures: 21 h, period 3 Preparation for lectures and exam: 105 h, period 3 Term paper writing: 34 h, period 3 Total workload: 160 h Blackboard in use.	
Evaluation	Grade 0-5, on the basis of 0-100 points for the exam (80%) and term paper (20%). Students are required to achieve 50 percent of the maximum points in both. Bonus points for active class participation.	
Study materials	1. David Hiller, Mark Grinblatt and Sheridan Titman: Financial markets and corporate strategy – European edition 2007 (Text book) 2. Brealey Myers: Principles of corporate finance, seventh edition (additional readings) 3. Handouts in class and all additional material required by the lecturer	
Prerequisites	Compulsory bachelor's level courses in finance and economics.	

A330A0000	CONTEMPORARY ISSUES IN INTERNATIONAL MARKETING	6 ECTS cr
	Contemporary Issues in International Marketing	
	The course has intensive teaching by an international visiting professor, complemented with an article package and independent study.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1	
Teacher(s)	N. N.	
Aims	Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo The learning outcomes of the course are the following: 1. To assess the contemporary concepts and issues ("hot topics") in international marketing. 2. To synthesize and evaluate contemporary international marketing phenomena. 3. To discuss and debate on special topic of international marketing (specified later) 4. To be able to collaborate in a cross-cultural teams.	
Content	The specific content of this course will vary depending on the visiting international professor. However, the course covers chosen contemporary concepts and issues affecting international marketing today.	
Modes of Study	30 hours of Intensive integrated lectures and exercises (assignments and cases) by the international guest lecturer 20 hours of preparation for exercises 30 hours of preparation for written exam 80 hours of individual independent study: reading the article package and writing of reflective essays Course total 160 h.	
Evaluation	Final grade 0-5. Evaluation 0-100 points: Reflective essay (50 points) Written exam (30 points) Exercises (20 points)	
Study materials	Material to be assigned in class.	
Prerequisites	Basic knowledge of international marketing	
A330A6010	BUYER-SELLER RELATIONSHIP MANAGEMENT	4 ECTS cr
	Buyer-Seller Relationship Management	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 4	
Teacher(s)	Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Hanna Salojärvi	
Aims	The aim of the course is to familiarize the students with the theory of relationship marketing, customer relationship management, related concepts and models. After completing the course the students: - are able to define the main concepts and know the principles of relationship marketing theory - are able to define and explain the building blocks of long-term customer relationships - are familiar with customer relationship management as an organization-wide strategic approach to managing customer relationships both in B2C and B2B markets - are able to describe different options to attract and retain customers both in B2B and B2C environments - know how to evaluate the performance of customer relationships - are able to analyze the customer base and recognize various strategies for managing customer relationships	

Content	Core content: Relationship marketing as a novel marketing paradigm, the development and categorization of customer relationships, specific features and building blocks of long-term customer relationships, customer value creation and measurement of customer life-time value, the strategic framework for customer relationship management. Additional content: The characteristics of a customer-relationship oriented firm, specific features of large customer management, challenges of CRM system implementation Special content: Technical characteristics of front- and back-office CRM applications, call-centre management, loyalty schemes
Modes of Study	18 hours of lectures, 4th period. Preparation for lectures 12 h, 4th period. Term paper preparation 20 h, 4th period. Written exam and preparation for exam 58 h. Total workload for student 108 h.
Evaluation	Grade 0-5, evaluation 0-100 points, written exam 70 %, term paper 30 %, all assignments must be passed to obtain final grade.
Study materials	1. Payne, Adrian (2006): Handbook of CRM: Achieving Excellence through Customer Management, Butterworth-Heinemann 2. Gupta, Sunil & Lehmann, Donald (2005), Managing Customers as Investments: The Strategic Value of Customers in the Long Run, Wharton School Publishing 3. Godson, Mark (2009), Relationship Marketing, Oxford University Press 4. Assigned readings 5. Lecture slides 6. Additional material distributed in class
Prerequisites	Basic course in the field of marketing or international marketing.

A350A0100	CONSULTING PROJECT AT LUT	6 ECTS cr
	Consulting Project at LUT	
	The maximum amount of participants is 25. Preference is given to MITIM and MIMM students and after that to Master's Students of LUT School of Business. In the possible selection of students, attention will be given to getting a versatile group from different areas of specializations.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Adjunct Professor, D.Sc (Econ.), Lic. Pol. Sc Timo Santalainen Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio	
Aims	By the end of the course the students will 1. Master key strategic concepts, tools and frameworks for strategizing. 2. Recognize the roles, styles and practices of strategy consulting in different situations. 3. Be able to apply strategic concepts, tools and frameworks in solving the consulting case problem. 4. Be able to outline a professional written report based on the results of their analysis and contributions. 5. Be able to communicate their findings and recommendations in a convincing, professional way.	
Content	Consulting Project at LUT is focused on strategy consulting with a very hands-on approach to learning: students take the role of strategy consultants to solve a case organization's concrete problem. The course and its ways of working are designed to help participants to explore strategic issues of selected companies/organizations from three perspectives: academic research and concepts (A), business practice (B), and consulting (C). Taking the role of strategy consultants participants are expected to develop value-generating ideas for their respective case organizations. The course is also aimed at the development of business "softskills" such as teamwork, leadership, project management, presentation and other communication skills.	

<p>Modes of Study</p> <p>Evaluation</p> <p>Study materials</p>	<p>Core content: Evolving motivations and approaches in strategic management and thinking within the context of (hyper)competitive multinational business arenas. Conceptual tools for strategic situational analysis. The logic of developing customer-centric and resource-based strategies as well as value-capturing business models. Alternative roles, styles and practices of strategy consulting.</p> <p>Additional content: Alternative modes and tools of “strategizing” in case- as well as in real business situations. Information collection and problem solving skills. Effective presentation skills.</p> <p>Prework: Reflective essay: appr. 30 h (reading and preparation of the essay) 16 hours of lectures (Kick-off workshop, attendance compulsory) 16 hours of seminars, including final presentations of the projects to the evaluation committee Independent project work in teams: 90 h (finding literature, group meetings, Information gathering, analysis, writing the report) Written final report, presentation of the project work (preparation 8 h) Total student workload: 160 h</p> <p>Grade 0-5, evaluation 0-100 points. Max 100 points from project work. Grading of projects: 30% case company 20% academic advisors 50% evaluation committee</p> <p>Santalainen, Timo (2006) Strategic Thinking, Talentum Handout materials relating to topics of each seminar Strategy consulting tools Other material depending on the project work</p>
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<p>A350A0150</p>	<p><i>CORPORATE STRATEGY FOR EMERGING MARKETS</i> 6 ECTS cr</p>
<p>Year and Period</p> <p>Teacher(s)</p> <p>Aims</p> <p>Content</p>	<p>Corporate Strategy for Emerging Markets</p> <p>M.Sc. (Econ. & Bus. Adm.) 2, Period 3 Visiting professor Andrei Panibratov, GSOM St. Petersburg State University Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio</p> <p>The learning outcomes of the course are the following: - to analyze how MNCs develop strategy for an emerging economy (Finnish firms in Russia as a core example); - to examine why and how companies from less developed countries compete internationally; - to assess how emerging markets’ companies organize their resources and capabilities to achieve competitive success in international context; - to outline what specific managerial approaches Russian companies use when entering and organizing activities in foreign countries.</p> <p>Must know: Internationalization: emerging market perspective; Developing coordination and control for emerging markets; Inward and outward FDI in emerging economies; The rise of emerging markets’ multinationals; Strategic choices for emerging MNCs;</p> <p>Core content: - Course subject and terminology. - Internationalization: emerging market perspective. - Developing coordination and control for emerging market. - Emerging economy: inward and outward FDI. - The rise of emerging markets’ multinationals. - Strategic choice for emerging MNCs.</p>

	<ul style="list-style-type: none"> - Evolution of Russian multinationals. - Organizational challenges and boundaries of Russian firms abroad. - Russian MNCs international strategies. <p>Additional content:</p> <ul style="list-style-type: none"> - Globalization of markets and internationalization of firms. - Approaches to foreign market entry. Greenfield and M&A. - Inward and outward perspective of internationalization. - Knowledge flows within multinational corporations. - Strategy for less developed economies: lessons from global firms. - The evolution of the organizational landscape in emerging economies. - The determinants of MNC activity in emerging economy. - Configurations of strategy and structure in MNC subsidiaries. - Investment decisions for emerging markets. - Factors of MNC's success in Russia. - Partnerships and strategic alliances for Russian markets - Joint ventures. Building successful partnerships in Russia. - The phenomenon of emerging multinationals. - Russian MNCs: entry strategies and post entry operations. - Natural resource and technology as alternative orientations of Russian MNCs. <p>Special content:</p> <ul style="list-style-type: none"> - the peculiarity of the strategy development for the emerging economy - the process of building the structure and strategy of Finnish firms in Russia, and the boundaries of MNC - specifics of investments to and from emerging economy, and motives and perspectives of inward and outward FDI - terminology and concepts of emerging firms' internationalization, the difference between 'global' and 'multinational' - strategic choice of MNC when internationalizing operations, and how to carry out the analysis the MNC environment - features of EMNC international strategies, and peculiarities of Russian firms' entry to foreign markets - the most important principles of international strategies of internationalizing firms with the focus to the Russian companies
Modes of Study	<p>45 h of lectures in the 3rd period Case studies and project work In- and out-class assignments Active participation Total student workload 160 h, out of which 115 hours is spent out-class (preparation for assignments, case studies and project work)</p>
Evaluation	<p>Final grade 0–5, evaluation 0–100 points. In-class activity 30 % Midterm assignment 30% Course project in study group 40%</p>
Study materials	<p>Basic reading Bartlett C.A., Ghoshal S., Beamish P.W. Transnational Management: Text, Cases, and Readings in Cross-Border Management, 5th ed., Irwin / McGraw-Hill, Boston (Mass), 2008 Larcon J.-P. Chinese Multinationals, World Scientific Publishing Co, 2009 Ramamurti, R., Singh, J.V. Emerging Multinationals in Emerging Markets, Cambridge University Press, 2009 Cases to be available prior the course: Brazilian multinationals: Vale, Petrobras, Embraer. Chinese multinationals: Bird, Haier, and TLC. Finnair: Re-Discover Russian Market. KGK goes to Brazil Nokian Tyres in Russia. Skanska: Leaving Russian Market – Failure or Part of the Strategy? YIT in Russia. Cases to be distributed and discussed within the course: Lukoil mini case Nordea vs Alfa Bank</p>

	<p>Fortum vs Gasprom</p> <p>Other required reading:</p> <p>Clercq, D., Sapienza, H.J. Crijns, H. The Internationalization of Small and Medium-Sized Firms, <i>Small Business Economics</i>, 2005, 24: 409-419.</p> <p>Cuervo-Cazurra, A., Genc, M. Transforming Disadvantages into Advantages: Developing Countries MNEs in the Least Developed Countries, <i>Journal of International Business Studies</i>, 2008, 39: 957-979.</p> <p>Dong, B., Zou, Sh., Taylor, Ch.R. Factors That Influence Multinational Corporations' Control of Their Operations in Foreign Markets: An Empirical Investigation, <i>Journal of International Marketing</i>, 2008, 16(1): 98-119.</p> <p>Filippov, S. Think Tank: Emerging into Europe. Foreign Direct Investments. London: Apr/May 2009.</p> <p>Freeman, S., Cavusgil, S.T. Toward a Typology of Commitment States Among Managers of Born-Global Firms: A Study of Accelerated Internationalization, <i>Journal of International Marketing</i>, 2007, 15(4): 1-40.</p> <p>Luo, Y., Tung, R.L. International Expansion of Emerging Market Enterprises: A Springboard Perspective, <i>Journal of International Business Studies</i>, 2007, 38: 481-498.</p> <p>Panibratov, A. Internationalization Process of Russian Construction Industry: Inward Investments Perspective, <i>Journal for East European Management Studies</i>, 2009, 2: 210-228.</p> <p>Panibratov, A. Russian Multinationals: Entry Strategies and Post-Entry Operations, <i>Electronic Publications of Pan-European Institute, Turku School of Economics, Finland</i>, 2010, 15.</p> <p>Panibratov, A., Kalotay, K. Russian Outward FDI and its Policy Context, <i>Vale Columbia Center on Sustainable International Investment, Columbia University</i>, 1, October 13, 2009.</p> <p>Ramamurti, R. What have we learned about emerging-market MNEs? in Ramamurti, R., Singh, J.V., <i>Emerging Multinationals in Emerging Markets</i>, Cambridge University Press, 2009.</p> <p>Zhanming, J. Corporate Strategies of Chinese Multinationals, in Larcon J.-P. <i>Chinese Multinationals</i>, World Scientific Publishing Co, 2009: 1-29.</p> <p>Zuohao, H., Gao, W. International Marketing Strategies of Chinese Multinationals: The Experience of Bird, Haier, and TLC, in Larcon J.-P. <i>Chinese Multinationals</i>, World Scientific Publishing Co, 2009: 99-126.</p>
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A350A0200	INTRODUCTION TO ECONOMICS	6 ECTS cr
	Introduction to Economics	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1	
Teacher(s)	Associate Professor, Ph.D. Jorma Sappinen, Professor, D.Sc. (Econ. & Bus. Adm.) Kalevi Kyläheiko, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen	
Aims	By the end of the course, students will be able to describe the principles of modern market economy. Students will be able to explain the basic concepts of microeconomics and macroeconomics and can apply models of consumer, firm, markets and economy in simple situations. In addition, students can analyse the role and consequences of monetary and fiscal policy.	
Content	Principles of microeconomics and macroeconomics. Demand, supply and market equilibrium, production and markets for the factors of production, economics of the public sector. Economic growth, unemployment, inflation, economic fluctuations, monetary and fiscal policy.	
Modes of Study	Web course. Independent preparation for Blackboard assignments and Blackboard assignments 160 h. Total workload for student 160 h.	
Evaluation	Grade 0-5, evaluation 0-100 points, Blackboard-assignments 100%	
Study materials	1. Mankiw, N.G. - Taylor, M.P.: <i>Economics</i> , 1st ed. or older edition of the same book Mankiw, N.G.: <i>Principles of Economics</i> , 3rd ed. 2. Collection of articles	

A350A0250	MULTIVARIATE AND ECONOMETRIC ANALYSIS METHODS	6 ECTS cr
	Multivariate and Econometric Analysis Methods	
	Course is suitable for postgraduate studies.	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Teacher(s)	Professor, D.Sc. (Tech.) Kaisu Puumalainen, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Heli Arminen	
Aims	The aim of the course is to give extensive general knowledge about the main econometric and multivariate analysis methods. After completion of the course students: <ul style="list-style-type: none"> - understand the role of multivariate analysis in scientific research - can evaluate and compare the applicability of various multivariate methods - are able to estimate collect numerical data about the market environment in different countries - can apply multivariate analysis methods for cross-sectional, panel and time series data - can conduct the analyses with SAS software - can interpret and evaluate the results of the analyses - can report the results according to good scientific practice General aim of the course is to improve following personal skills of the students: <ul style="list-style-type: none"> - written and oral communication - group work skills in a multicultural team context - problem solving and project management skills 	
Content	Measure development and factor analysis, cluster analysis, linear regression, linear models, logistic regression, autocorrelation, stationarity, panel data regression Use of SAS software, use of international databases of statistical data. Special features of countries.	
Modes of Study	Lectures 21 h, exercises 21 h, independent data collection and analysis using the SAS software 55 h, 3rd period. Seminar 8 h, independent analysis, writing of report and preparing for presentation 55 h, 4th period. Total workload for student 160 h.	
Evaluation	Final grade 0-5, evaluation 0–100 points, written report 75%, oral 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.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
A380A0050	GLOBAL SOURCING	6 ECTS cr
	Global Sourcing	
	If all the students attending the course are Finnish the course will be lectured in Finnish. Replaces AC20A0050 - Kansainväliset hankinnat	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 3-4	
Teacher(s)	Associate Professor, D.Sc. (Econ. & Bus. Adm.) Katrina Lintukangas	
Aims	The aim of the course is to give extensive general knowledge about global sourcing and international business process from the perspective of the downstream of the value chain. After completion of the course students: <ul style="list-style-type: none"> - understand the strategic meaning of supply management in global companies - can explain the focal theories and concepts related to international supply networks and supply market 	

	<ul style="list-style-type: none"> - are able to estimate the alignment of global strategy and organizing of supply management - name and describe different supply channels - recognize the risks of global sourcing - recognize the ethical and moral problems concerning the origin of the products and materials - understand the basics of ecological and green sourcing and sustainable procurement. <p>General aim of the course is to improve following personal skills of the students:</p> <ul style="list-style-type: none"> - managerial communication - group work skills - problem solving and project management skills
Content	<p>Special features of global sourcing, opportunities and risks. Global supply strategies and organizing. Supply channels and modes of activities. International supply market and concept of supply network. Green sourcing and ethics in international business. Sourcing process and negotiations in international environment. Special features of countries and cultures.</p>
Modes of Study	<p>Lectures 14 h, independent reading assignments and preparation for lectures 28 h, 3rd period. Exercises 14 h including case assignments in groups, written reports and class presentations. Writing of reports and preparations for presentations and exercises 44 h, 4th period. Written exam and preparation for exam 60 h. Total workload for student 160 h.</p>
Evaluation	<p>Grade 0-5, evaluation 0-100 points, written exam 60%, case-reports 40 %, all assignments must be passed to obtain final grade.</p>
Study materials	<p>Lecture slides Assigned reading, collection of articles</p>
Prerequisites	<p>The names of the course books will be informed later. AC20A0001 Hankintatoiminnan perusteet or A130A0200 Hankintatoimen perusteet</p>
Further Information	<p>This course has 1-5 places for open university students. More information on the web site for open university instruction. Enrolment to tutorial groups in WebOodi</p>

A380A0200	PROMOTION AND SALES MANAGEMENT	6 ECTS cr
	Promotion and Sales Management	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 4	
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen Person in Charge: Professor, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio, Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen	
Aims	<p>After completing the course the student will understand how marketing communication (MC) and sales management (SM) are planned and implemented in an organization. This course will pay special emphasis on understanding the linkages between marketing communication and sales, and the challenges in their integrated management.</p> <p>The learning outcomes of the course are the following:</p> <ul style="list-style-type: none"> - to understand the role of MC and SM in marketing strategy - to assess the usability of different forms of communication with regard to buyer behavior - to be able to design, implement and manage marketing communication as part of the marketing process - to be able to design, implement and manage sales as part of the marketing process - to assess the challenges of integrating MC and sales management strategies - to evaluate the effectiveness of MC and sales - to recognize the ethical issues of promotion and sales management 	
Content	Process of personal selling. Different types of personal selling. The	

Modes of Study	responsibilities and tasks of sales management. The responsibilities and tasks of sales management. Lectures 27 h 4th period. Exercises 15 h 4th period. Homework 60 h and preparation for the exam 58 h. Written exam.
Evaluation	Total workload for student 160 h. Grade 0-5, evaluation 0-100 points.
Study materials	Literature and study materials will be announced later.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

A380A6000	CROSS-CULTURAL ENCOUNTERS	3 ECTS cr
	Cross-Cultural Encounters	
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	Learning outcomes: By the end of the course, students will know why it is important to understand and appreciate cultural differences both in business and private life. Students will be able to explain the basic concepts of intercultural communication by the main course themes: cultures and communication, verbal and nonverbal communication, national stereotypes, intercultural sensitivity, cross-cultural interaction, culture shock, adaptation, cultures and organizations, expatriate assignments. Students will be able to describe themselves as an intercultural communicator, recognize symptoms of culture shock in their own life and know how to make intercultural adaptation process easier.	
Content	The purpose of the course is to develop students' abilities to understand and appreciate cultural differences both in business and private life. Cultures and communication, verbal and nonverbal communication, national stereotypes, intercultural sensitivity, cross-cultural interaction, culture shock, adaptation, intercultural effectiveness, cultures and organizations, expatriate assignments.	
Modes of Study	24 hours of lectures and case exercises in English and 56 hours of out-class work. Total course 80 h.	
Evaluation	Graded 0-5 on the basis of activity, assignments given during the lectures and a portfolio composed of them Case exercises 80 %, active participation and attendance 20 %. Evaluation 0 – 100 points.	
Study materials	Reading material for the course provided by the lecturer.	
Prerequisites	Active participation and 80 % attendance.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

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	
Aims	Student 1. knows the special economic and business features and development of the emerging markets 2. can evaluate and analyze the risks and opportunities for investment, and choose the right modes of operations in TEs.	
Content	Country profiles of European transitional economies (TEs). The communist legacy in TEs. Macro-economic framework of the transitional process. Post-	

Modes of Study	communist region in the global economy. Risks and opportunities in the TE markets. Investment climate and foreign direct investment in the TEs. EU's enlargement process. 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, Karhu Anna: Twenty Years of Post-Communist Transition in Europe, Northern Dimension Research Centre, Publication n:o 56, Lappeenranta University of Technology 2009. 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. Tiusanen Tauno, Karhu Anna: Twenty Years of Post-Communist Transition in Europe, Northern Dimension Research Centre, Publication n:o 56, Lappeenranta University of Technology 2009.
Prerequisites	CS10A0550 International Business Methods.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

CS10A0651	MANAGEMENT OF INNOVATIONS IN RUSSIA 5 ECTS cr
	Management of Innovations in Russia
Year and Period	M.Sc. (Tech.) 1, Period 4
Teacher(s)	Lecturer, M.Sc. (Econ. & Bus. Adm.) Daria Podmetina Lecturer, M.Sc. (Econ. & Bus. Adm.) Irina Savitskaya Person in Charge: Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student knows 1. how to apply theories of national/regional innovation systems 2. how to analyze the interaction between main players of the innovation system (universities and research organizations, enterprises, government and industries) 3. how innovation process is managed in Russia 4. how global environment and international collaboration influence the innovation management process 5. how study the innovativeness of the enterprises 6. aspects of open innovations.
Content	National Innovation System (NIS) in Russia. Models, main players, role of government, innovation policy, role of universities and research institutions, regional diversity of innovations (regional innovation system RIS), science parks and innovation centers. Innovative industries in Russia, high-tech and low-tech industries. International cooperation and innovations. Role of FDIs, spillovers, exports. Innovations as the source of competitive advantage. Key issues of technology and innovation management in Russia. Aspects of open innovations, internal R&D, technology transfer and business model innovations. Suitable also for postgraduate studies.
Modes of Study	Lectures 14 h, written report 45 h, course literature 45 h, self study and exam preparation 30 h. Total 134 h.
Evaluation	0-5, exam 60 %, written report 40%
Study materials	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.

Prerequisites	<p>Gurkov, I. (2004) Business Innovation in Russian Industry, Post-Communist Economies, Vol. 16, No. 4, pp. 423-438</p> <p>Torkkeli, M., Vaatanen, J , Podmetina, D., Yla-Kojola, A-M.,. (2009) Knowledge absorption in an emerging economy – the role of foreign investments and trade flows in Russia, International Journal of Business Excellence, Vol. 2, No.3/4 pp. 269 – 284</p> <p>Desai, R.M., Goldberg, I, Enhancing Russia's competitiveness and innovative capacity, The World Bank</p> <p>Additional material will be announced at the lectures.</p> <p>CS10A0800 The Basics of Doing Business in Russia, exceptions can be granted for special reasons. 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.</p>
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CS10A0751	<i>ENTERPRISES AND COMPETITION IN RUSSIA 6 ECTS cr</i>
Year and Period	M.Sc. (Tech.) 1, Period 3
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student is able to 1. explain the theory of transition from centrally planned economy (CPE) to market economy 2. assess competitiveness of industrial sectors and enterprises 3. evaluate the impact of foreign direct investment on the development of transitional economy 4. explain the methods of increasing competitiveness and productivity on national, industrial and enterprise level.
Content	Privatization process and deregulation of the economy. Russian enterprise structures and emergence of new enterprises. Natural resources and consumer markets. Russia's competitiveness and foreign direct investment development. Role of government in transition process.
Modes of Study	Lectures 28 h, seminar work and presentation 50 h, course literature 45 h, self study and exam preparation 30 h. Total 153 h.
Evaluation	0-5, exam 60 %, written report 20%, presentation 20%
Study materials	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. 185 p.
Prerequisites	Additional material will be announced on lectures. CS10A0800 The Basics of Doing Business in Russia, exceptions can be granted for special reasons. 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.

CS10A0852	<i>EUROPEAN UNION – COMPETITIVENESS AND 5 ECTS cr ENLARGEMENT</i>
Year and Period	M.Sc. (Tech.) 1, Period 4
Teacher(s)	Professor, D.Sc. (Tech.) Juha Väättänen
Aims	Student is able to 1. assess the competitiveness of EU in global economy 2. explain the process of European Union enlargement and it's influence on the competitiveness of EU 3. identify the factors affecting competitiveness and analyze the state and development of a country according to these measures.
Content	European Union global competitiveness. Enlargement process and profiles of new EU members. Trade and investment flows. Country competitiveness research methodologies.
Modes of Study	Lectures 21 h, seminar work and presentation 40 h, course literature 35 h, self study and exam preparation 30 h. Total 126 h.
Evaluation	0-5, exam 60 %, presentation 40%
Study materials	UNCTAD, World Investment Report 2011, United Nations 2011. World Economic Forum, Global Competitiveness report 2011-2012. WEF 2011.

Prerequisites	Tiusanen, T., Karhu, A.: Twenty Years of Post-Communist Transition in Europe. Northern Dimension Research Centre, Publication n:o 56, Lappeenranta University of Technology 2009. Additional material will be announced on lectures. 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.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.
CS30A1500	TRANSPORTATION SYSTEMS 5 ECTS cr
Year and Period	Transportation Systems, Kuljetusjärjestelmät M.Sc. (Tech.) 1-2, Period 4 int.
Teacher(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli-Pekka Hilmola
Aims	Student 1. understands the application of different transportation modes in transportation logistics area, particularly in Eurasia 2. knows the most suitable international routes and their performance 3. knows organizational and technology development in transportation logistics, and their application and relationship on the overall performance 4. has a knowledge from environmental issues of transportation logistics - especially from the use of railways, intermodality, and containers 5. understands the environmental emissions caused by transportation systems, and the usage of dry ports for the reduction of these emissions.
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, exercises 12 h; exercises conducted as a whole at the class room hours, but exam requires 104 hours from student in terms of reading course literature and getting familiar with other material. Total 130 h. Course webpage could be accessed through following link: http://kouvola.lut.fi/fi/tutkimus/innorail/transportationsystem
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://info.tse.fi/julkaisut/vk/Ae6_2005.pdf 2. Roso, Violeta (2009). The Dry Port Concept. Chalmers University of Technology. Doctoral Dissertation. ISBN 978-91-7385-338-5. Available at URL: https://document.chalmers.se/download?docid=281072365 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 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 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/
Prerequisites	Recommended to have taken some logistical courses before, e.g. from topics of supply chain management and production control.
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.

CS30A1660	OPEN INNOVATION	5 ECTS cr
	Open Innovation	
Year and Period	M.Sc. (Tech.) 2, Period 3	
Teacher(s)	Researcher, M.Sc. (Tech.) Antero Kutvonen Visiting lecturers	
Aims	Person in Charge: Professor, D.Sc. (Tech.) Marko Torkkeli Student 1. can explain the concept of open innovation through both theory and examples (to e.g. a company executive) 2. identifies open innovation activities in real life companies and explain the motives for engaging in them and the mechanisms through which they create value for the company 3. can distinguish between modes of inbound and outbound open innovation 4. can analyze the relation between a company's strategic choices and application of open innovation 5. attains a basic familiarity with the scientific literature on the theme and the ability to view open innovation in the context of other innovation management theories.	
Content	Must know: The fundamental definitions and concept of open innovation. Modes of inbound open innovation, i.e. external acquisition of knowledge, and outbound open innovation, i.e. external exploitation of knowledge. Difference between closed and open innovation in managing technology. Identifying open innovation activities in real life firms. Monetary and strategic motives for engaging in open innovation. Should know: Process models of inbound and outbound open innovation. The role and importance of the individual process phases. The relation between corporate strategy, technology strategy and open innovation activities. Most common examples of firms used to explain open innovation. Varying topics from state-of-the-art open innovation research, depending on guest lecturer. Nice to know: Development of the open innovation concept on the basis of prior innovation management theories. Knowledge of the main scientific literature surrounding open innovation. Theoretical determinants of open innovation.	
Modes of Study	Lectures and guest speakers 28 h as intensive teaching. Small group assignments during lectures. Group exams (or substituting them with summaries of scientific articles, 24 h) on each intensive day, preparing for exams 24 h. Independent study 72 h. Total 124 h.	
Evaluation	Graded on a scale of 0-5. Continuous evaluation based on small group exams (80%) and participation in lectures (20%). Possibility to substitute group exams with literary work (summaries of scientific articles) in case of absence.	
Study materials	The course book and reading material will be announced at the first lecture.	
Prerequisites	Recommended: CS30A1001 Product and Technology Strategy: Advanced Course in Innovation Management, CS34A0500 Technology Commercialization and Corporate Venturing	
CS30A7110	MANAGEMENT OF INNOVATION AND TECHNOLOGY	3 ECTS cr
	Innovaatio- ja teknologiajohtaminen	
Year and Period	B.Sc. (Tech.) 3, Period 3	
Teacher(s)	Professor, D.Sc. (Tech.) Tuomo Kässi	
Aims	Learning outcomes: After having passed the course the student can identify the main concepts and definitions of innovation and technology management; explain the different viewpoints of enterprise operations through the frameworks of new product/service development as well as explain the phases. He/she can identify the significance of networks in innovation and technology management, and apply the principles of innovation and technology management on selected problem area. He/she can understand a build-up of company networks and develop solutions for the issues relating to them.	
Content	The course reviews basic ideas and concepts of strategic and operational	

Modes of Study	innovation technology management including: - Management of innovation - New product development - Technology strategy - Competitive advantage and dynamic capabilities - Alliance and networking strategies - Enabling effective innovative organizations
Evaluation	21 hours of lectures in English in 3. period. Lectures 21 hours, preparation for the exam 60 hours, altogether 81 hours. Written exam to pass the course.
Study materials	Graded 0-5 on the basis of a written examination 100 % 1. Baker, Michael - Hart, Susan: Product Strategy and Management, Prentice Hall, England, 1999 or newer edition 2. Tidd, Joe - Bessant, John - Pavitt, Keith: Managing Innovation, Integrating Technological, Market and Organizational Change, John Wiley & Sons, England, 2005 or newer edition 3. Other materials assigned given at lectures.
Prerequisites	Basic knowledge of industrial and business management
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.
CS34A0500	TECHNOLOGY COMMERCIALIZATION AND CORPORATE VENTURING 5 ECTS cr
	Technology Commercialization and Corporate Venturing, Teknologian kaupallistaminen
Year and Period	M.Sc. (Tech.) 2, Period 4 int.
Teacher(s)	Professor, D.Sc. (Tech.) Marko Torkkeli Visiting lecturers
Aims	Student understands the characteristics of technology commercialization and high growth technology ventures.
Content	This course examines issues related technology commercialization, corporate venturing, and ways to profitably exploit business opportunities. Business models.
Modes of Study	Suitable also for postgraduate studies. Lectures 28 h, 4. period. Journal article reading 50 h, 4. period. Seminar work writing 60 h, 4. period. Total 138 h.
Evaluation	0-5
Study materials	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.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.
FV18A9900	FINNISH SOCIETY AND CULTURE 2 ECTS cr
	Finnish Society and Culture
Year and Period	Period 1 and 3
Teacher(s)	M.A. Kristiina Korjonen-Kuusipuro, 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) and lifestyle, 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) G) Nature and Landscape (4 lectures) H) Written lecture diary
Evaluation	Pass/fail on the basis of participation 60% and a written lecture diary 40%.
Study materials	Portraying Finland. Facts and Insights. Otava 2005. (Available in the library)

8. Language Centre Courses 2011–2012

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. 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>	
FV11A2201	Technical English Reading Course	2
FV11A2600	Business English Reading Course	2
FV11A4400	English Communication for Engineering Professionals I	4
FV11A4800	English Communication for Business and Management I	5
FV11A6204	English for Professional Meetings and Discussions	2
FV11A6500	Presenting in English	2
FV11A8400	English Communication for Engineering Professionals II	4
FV11A8800	English Communication for Business and Management II	6
FV11A8900	Academic Writing in English	4
FV11A9350	English Clinic for Researchers and PhD Students	5
FV12A1210	Basic Course in German 1	2
FV12A1220	Basic Course in German 2	2
FV12A1410	Intermediate Course in German 1	2
FV12A1420	Intermediate Course in German 2	2
FV12A1611	German for Working Life	2
FV12A3300	Information on Germany	2
FV12A5202	German Independent Study	1 - 2
FV12A5600	German and Engineering	1 - 2
FV12A7113	Business German	4
FV14A1200	Russian 1	3
FV14A1400	Russian 2	3
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
FV15A5301	French for Economy and Business	3
FV15A6003	Intercultural course in French	4
FV15A9301	French Independent Study	1 - 4
FV16A1210	Basic Course in Spanish 1	2
FV16A1220	Basic Course in Spanish 2	2
FV16A1410	Intermediate Course in Spanish 1	2
FV16A1420	Intermediate Course in Spanish 2	2
FV16A1602	Spanish for Working Life	3
FV16A3201	Business Spanish	3
FV16A5202	Intercultural Spanish Course	4
FV18A9101	Finnish 1	2
FV18A9201	Finnish 2	2
FV18A9301	Finnish 3	2
FV19A1000	Chinese 1	3

FV19A2000	Chinese 2	3
FV19A3500	Business Chinese	3
FV19A5000	Chinese for Oral Communication	3

<i>FV11A2201</i>	<i>TECHNICAL ENGLISH READING COURSE</i>	<i>2 ECTS cr</i>
	Technical English Reading Course	
Year and Period	B.Sc. (Tech.) 1-2, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, M.A. 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 general technical vocabulary and the ability to read quickly and effectively.	
Content	Vocabulary exercises, skimming, scanning and affixes, reading comprehension exercises, individual, pair or group work. The language of instruction: English.	
Modes of Study	28 hours of contact or online lessons, with 24 hours required for homework and self-study. 50% attendance and active participation are required.	
Evaluation	Marks are based on a reading comprehension test (duration 90 minutes). Pass/Fail. 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 sit the exam. Provided by the teacher. Blackboard.	
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 FV11A2600 Business English Reading Course are not eligible for this course.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

<i>FV11A2600</i>	<i>BUSINESS ENGLISH READING COURSE</i>	<i>2 ECTS cr</i>
	Business English Reading Course	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 1-2, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, M.A. Jukka Taipale Part-time Untenured Teacher, N. N.	
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 and 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. Classroom-based teaching. 50% attendance required.	
Evaluation	Marks are based on a reading comprehension test (duration 90 minutes). Pass/Fail. 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 sit the exam. Provided by the teacher. Blackboard.	
Prerequisites	Students who have taken FV11A2201 Technical English Reading Course are not eligible for this course.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

FV11A4400	ENGLISH COMMUNICATION FOR ENGINEERING PROFESSIONALS I	4 ECTS cr
	English Communication for Engineering Professionals I	
Year and Period	B.Sc. (Tech.) 1-3, Period 1-2, 3-4	
Teacher(s)	Lecturer, B.A. Hwei-Ming Boey	
CEF Level	B2 - C1	
Aims	To develop and maintain speaking, listening and reading skills, focussing on themes related to engineering. On completion of the course, students should be able to read and understand written texts related to engineering issues, understand spoken texts, and discuss topical engineering issues with a degree of fluency permitting active participation in study and work.	
Content	Various topical issues such as the environment, the digital world, machines, and materials.	
Modes of Study	Language of instruction: English. 49 contact hours (over 2 periods) + 55 hours independent study Active communication practice during the contact hours, based on authentic written and spoken texts. Tests: 1) listening comprehension 2) conversation 3) written assignment. A minimum of 80% attendance required for exemption from the conversation test and the written assignment.	
Evaluation	Pass / Fail.	
Study materials	Provided by the teacher.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
FV11A4800	ENGLISH COMMUNICATION FOR BUSINESS AND MANAGEMENT I	5 ECTS cr
	English Communication for Business and Management I	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 1-3, Period 1-2, 3-4	
Teacher(s)	EFL Instructor, B.A. Riitta Gröhn Lecturer, HBA Paula Haapanen Lecturer, M.A. Jukka Taipale	
CEF Level	Entry level must be at least B2.	
Aims	Learning outcomes: Upon completion of the course, students should be able to communicate effectively and with confidence on topical issues in professional contexts, and demonstrate ability to use various learning tools and strategies to further their own learning.	
Content	The contents of the course will be updated in Noppa.	
Modes of Study	The course is a 5 ECTS course, consisting of 130 hours of work, which will be delivered using multiple modes of study, including contact, online, individual and group work. Specific details on the course's structure will be updated into Noppa and also distributed as a handout during the first class. 80% attendance is required for contact lessons.	
Evaluation	Pass / Fail.	
Study materials	Various sources of information will be used, including (but not limited to), books, the Internet, journals, etc, as well as handouts provided by the teacher. Blackboard.	
Prerequisites	Business English Reading Course	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

<i>FV11A6204</i>	<i>ENGLISH FOR PROFESSIONAL MEETINGS AND DISCUSSIONS</i>	<i>2 ECTS cr</i>
	English for Professional Meetings and Discussions	
Year and Period	M.Sc. (Tech.) 1-2, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 3-4	
Teacher(s)	Lecturer, B.A. Hwei-Ming Boey	
CEF Level	B2 and above	
Aims	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.	
Modes of Study	24 contact hours + 28 hours independent study. Active participation in class, and self-study of language of meetings. Regular attendance required. Note: Participants in the intensive groups (B, C and D) are required to do pre-course preparation. The material will be sent at least 4 weeks before the beginning of the course.	
Evaluation	Continuous assessment, frequent short quizzes, and written assignment. A minimum of 80% required for exemption from the written assignment.	
Study materials	Pass / Fail.	
Further Information	Provided by the teacher. This course has 1-5 places for open university students. More information on the web site for open university instruction.	

<i>FV11A6500</i>	<i>PRESENTING IN ENGLISH</i>	<i>2 ECTS cr</i>
	Presenting in English	
Year and Period	B.Sc. (Tech.) 2-3, B.Sc. (Econ. & Bus. Adm.) 2-3, Period 1, 2, 3, 4	
Teacher(s)	Lecturer, B.A. (Hons), P.G.C.E. Peter G. Jones Lecturer, HBA Paula Haapanen	
CEF Level	B2 and above	
Aims	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. Language of instruction: English.	
Modes of Study	Contact lessons: 24 Homework: 25+ Classroom exercises, presentation practice, and homework. Blackboard. Classroom-based course. 80 % attendance required.	
Evaluation	Pass/Fail. Evaluated presentation (100%).	
Study materials	Provided by the teacher.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

<i>FV11A8400</i>	<i>ENGLISH COMMUNICATION FOR ENGINEERING PROFESSIONALS II</i>	<i>4 ECTS cr</i>
	English Communication for Engineering Professionals II	
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2, 3-4	
Teacher(s)	Lecturer, B.A. (Hons), P.G.C.E. Peter G. Jones	
CEF Level	B2-C1+	
Aims	To develop and maintain speaking, listening and reading skills, focussing on	

Content	themes related to engineering. On completion of the course, students should be able to communicate effectively about issues dealt with in the course, and use the language skills developed in instances of professional communication beyond the classroom.
Modes of Study	Various topical issues such as Engineering and Society, Innovations, and Energy Issues. 49 contact hours (over 2 periods) + 55 hours independent study Active communication practice during the contact hours, based on authentic written and spoken texts.
Evaluation	Tests: 1) reading comprehension 2) conversation 3) written assignment. A minimum of 80% attendance required for exemption from the conversation test and the written assignment.
Study materials	Pass / Fail.
Further Information	Provided by the teacher. This course has 1-5 places for open university students. More information on the web site for open university instruction.

FV11A8800	ENGLISH COMMUNICATION FOR BUSINESS AND MANAGEMENT II 6 ECTS cr
Year and Period	English Communication for Business and Management II M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1-2, 3-4
Teacher(s)	Lecturer, M.A. Jukka Taipale Lecturer, HBA Paula Haapanen EFL Instructor, B.A. Riitta Gröhn
CEF Level	Entry level upper B2/C1.
Aims	Learning outcomes: Building on the learning outcomes stated in FV11A4800 English Communication for Business and Management I, upon completion of the course, students should be able to communicate effectively and with confidence in professional and academic contexts, and demonstrate knowledge and ability to communicate in global contexts.
Content	The course content will be updated in Noppa at a later date.
Modes of Study	This course is a 6 ECTS course, made up of 156 hours of work, which will be delivered through multiple modes of study including contact, online, individual and group work. Specific details on the course's structure will be updated into Noppa and will be given out in class at the first contact lesson. 80% attendance is required for contact lessons.
Evaluation	Pass / Fail.
Study materials	Various sources of information will be used, including books, the Internet, journals, etc., as well as handouts provided by the teacher. Blackboard.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

FV11A8900	ACADEMIC WRITING IN ENGLISH 4 ECTS cr
Year and Period	Academic Writing in English M.Sc. (Tech.) 1-2, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1-2, 3-4
Teacher(s)	Lecturer, HBA Paula Haapanen EFL Instructor, B.A. Riitta Gröhn Part-time Untenured Teacher, N. N.
CEF Level	B2 - C1
Aims	At the end of the course, students are expected to be able to identify the characteristics of academic writing in their field and apply them to their own writing and write an academic paper meeting academic conventions in their field.
Content	Students will study features of English for academic and scientific writing, after which they will write an exam. When students have passed the exam, they will be permitted to produce a paper to complete the 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.
Evaluation	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.
Study materials	Pass / Fail based on an exam at the mid-term and on the subsequent submission of a satisfactory academic paper.
Further Information	Bailey, S., Academic Writing: A Handbook for International Students. 3rd ed, Oxon, England: Routledge, 2011. Supplementary materials will be provided as needed. Blackboard.
	This course has 1-5 places for open university students. More information on the web site for open university instruction.
FV11A9350	ENGLISH CLINIC FOR RESEARCHERS AND PHD STUDENTS 5 ECTS cr
Year and Period	English Clinic for Researchers and PhD Students
Teacher(s)	Period 3-4
Aims	Lecturer, B.A. (Hons), P.G.C.E. Peter G. Jones
Content	The aim of the course is to assist doctoral students and junior researchers with the writing and preparation of a paper for publication in a journal or at a conference.
Modes of Study	On successful completion of the course, students will have an improved understanding of the language of the genre of academic writing – structure, style, unity, cohesion etc, the skills to approach the writing of academic articles effectively, and a draft version of a short paper ready for submission to a journal or conference.
Evaluation	The course will address issues such as the publishing process, approaches to writing, structure and language, common problems for non-native speakers of English, and drafting, revision and review.
Study materials	Language of instruction: English.
Prerequisites	48 contact hours in the form of seminars, small group work and individual study, plus the time required to produce a paper ready for submission. The course is made up of at least 125 hours of work.
Further Information	Pass / Fail
	Provided by the teacher.
	A research area and research question.
	This course has 1-5 places for open university students. More information on the web site for open university instruction.
FV12A1210	BASIC COURSE IN GERMAN 1 2 ECTS cr
Year and Period	Saksan peruskurssi 1
Teacher(s)	Period 1, 2, 3, 4
CEF Level	Lecturer, M.A. Pirjo Rantonen
Aims	Lecturer, Jörg Wunderlich
Content	A1
	By the end of the course, students are expected 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 and to use polite phrases and expressions typical of the German communication culture.
Modes of Study	Situations: personal data, introducing oneself, time 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, Finnish and English.
	Exercises that support communication skills.
	Contact hours 28, independent study approx. 24 hours.

Evaluation	Written examination. Oral test or grade based on continuous assessment.
Study materials	Continuous assessment requires 75% attendance and active participation.
Further Information	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. Pass/Fail. Alltag, Beruf & Co. 1, chapters 1 - 5. This course has 11-15 places for open university students. More information on the web site for open university instruction.

FV12A1220	BASIC COURSE IN GERMAN 2	2 ECTS cr
	Saksan peruskurssi 2	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, M.A. Pirjo Rantonen Lecturer, Jörg Wunderlich	
CEF Level	Teaching level: A1.	
Aims	By the end of the course, students are expected 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 and to use polite phrases and expressions typical of the German communication culture.	
Content	Situations: making purchases and placing orders, giving directions, agreeing on schedules, family, greetings. Structures: modal verbs, ordinals, accusative and dative use of personal pronouns, possessive pronouns.	
Modes of Study	Languages of instruction: German, Finnish and English. Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours.	
Evaluation	Written examination. Oral test or grade based on continuous assessment.	
Study materials	Continuous assessment requires 75% attendance and active participation.	
Prerequisites	Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade.	
Further Information	Students who have passed the course FV12A1200 German 1 are not eligible for this course because of the similar contents of the courses. Pass/Fail. Alltag, Beruf & Co. 1, chapters 6 - 10. FV12A1210 Basic Course in German 1 or corresponding skills. This course has 11-15 places for open university students. More information on the web site for open university instruction.	

FV12A1410	INTERMEDIATE COURSE IN GERMAN 1	2 ECTS cr
	Saksan jatkokurssi 1	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, M.A. Pirjo Rantonen Lecturer, Jörg Wunderlich	
CEF Level	Teaching Level A1.	
Aims	By the end of the course, students are expected 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 and to understand and apply the most important German customs.	
Content	Situations: describing oneself, organisation and discussion of travels and meetings, talking about health. Structures: imperative, separable verbs, perfect tense, sein and haben in the past tense.	

Modes of Study	Languages of instruction: German, Finnish and English. Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. 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	Alltag, Beruf & Co. 2, chapters 1 - 5.
Prerequisites	FV12A1220 Basic Course in German 2, FV12A1200 German 1 or equivalent skills.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

FV12A1420	INTERMEDIATE COURSE IN GERMAN 2	2 ECTS cr
	Saksan jatkokurssi 2	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, M.A. Pirjo Rantonen Lecturer, Jörg Wunderlich	
CEF Level	Teaching Level A1.	
Aims	By the end of the course, students are expected 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 and to understand and apply the most important German customs.	
Content	Situations: home and decorating, job interview, informal meetings, small talk. Structures: two-way prepositions, subordinate clauses, adjective endings, possessive pronouns.	
Modes of Study	Languages of instruction: German, Finnish and English. Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. 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	Alltag, Beruf & Co. 2, chapters 6 - 10.	
Prerequisites	FV12A1410 Intermediate Course in German 1 or equivalent skills.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

FV12A1611	GERMAN FOR WORKING LIFE	2 ECTS cr
	Työelämän saksaa	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, M.A. Pirjo Rantonen Lecturer, Jörg Wunderlich	
CEF Level	Teaching Level A2	
Aims	By the end of the course, students are expected to be able to discuss topics introduced during the course, to be able to write texts on topics discussed during the course, to understand texts on topics discussed during the course and to understand the most important German customs in the world of work.	
Content	Situations: introducing oneself and others, talking about one's career, duties at work, describing the weather, where you live and where you work, plans for the	

Modes of Study	<p>future, small talk, telephone conversations. Structures: past tense, genitive, conjugation of adjectives, subordinate clauses, comparison, conditional, infinitive. Languages of instruction: German, Finnish and English. Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. 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 FV12A1610/FV12A1620 German for Working Life 1 or 2 are not eligible for this course because of the similar contents of the courses.</p>
Evaluation	Pass/Fail.
Study materials	Alltag, Beruf & Co. 3.
Prerequisites	FV12A1420 Intermediate Course in German 2 or equivalent skills.
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.

<i>FV12A3300</i>	<i>INFORMATION ON GERMANY</i>	<i>2 ECTS cr</i>
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, Jörg Wunderlich	
CEF Level	Teaching level B1.	
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 know the basic information on Germany, to use their oral skills in cooperation with German partners, and to give presentations in German.	
Content	Discussions on cultural differences between Finland and Germany, and on the following topics: geography, culture, media, history, politics, sports, and climate. Students prepare a short presentation on a topic related to the country. Language of instruction: German.	
Modes of Study	Contact lessons 28, independent work approx. 24 hours. Pair and group assignments, role play. Grade based on continuous assessment or an oral and written test. Continuous assessment requires 75% attendance and active participation.	
Evaluation	Pass/Fail.	
Study materials	Materials provided by the teacher.	
Prerequisites	Courses at the level A2 or equivalent skills.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

<i>FV12A5202</i>	<i>GERMAN INDEPENDENT STUDY</i>	<i>1 - 2 ECTS cr</i>
	Saksan itseopiskelukurssi	
Year and Period	Period 1, 2, 3, 4	
Teacher(s)	Lecturer, M.A. Pirjo Rantonen Lecturer, Jörg Wunderlich	
CEF Level	Teaching level: B1 - 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.	
Content	Independent work in German in the student's own field. Can be combined with the student's professional studies. Dependent on what is agreed between the student and teacher, e.g. goals, contents and schedule. Topics in the field of technology: Lecturer Jörg Wunderlich. Topics in the field of economics: Lecturer Pirjo Rantonen.	

Modes of Study	Language of instruction: German. Independent work approx. 26 or 52 hours.	
Evaluation	Assessment based on a learning journal and assignments.	
Prerequisites	Pass/Fail.	
Further Information	Courses at the level A2 or equivalent skills. This course has 1-5 places for open university students. More information on the web site for open university instruction.	
FV12A5600	GERMAN AND ENGINEERING	1 - 2 ECTS cr
Year and Period	Deutsch und Technik	
Teacher(s)	Period 1, 1-2, 3 Lecturer, Jörg Wunderlich	
CEF Level	0-A2	
Aims	Group A: Structural materials: 1 ECTS cr: By the end of the course, students are expected to know how to search for study materials in German and use them in the assignments given in the course Structural Materials. 2 ECTS cr: By the end of the course, students are expected to know the basic terminology in the field, to know the grammatical structures needed in technical language and to be able to understand texts of the field to some extent.	
Content	Group B: Deutsch und Energie By the end of the course, students are expected 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 and to be able to give a presentation in German. Group C: Deutsch im Maschinenbau By the end of the course, students are expected to know basic terminology in the field, to be able to describe a technical process, to understand texts on mechanical engineering and to know grammar needed in technical language. Group A: Structural Materials: 1 ECTS cr: Learning the terminology on the topic of structural material and using it in the search of study material. Language of instruction: German/Finnish/English. 2 ECTS cr: Revision of grammar needed in technical language. Spoken and written exercises on structural materials. Language of instruction: German/Finnish/English. Group B: Deutsch und Energie 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. Group C: Deutsch im Maschinenbau 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.	
Modes of Study	Group A: Structural Materials 1 ECTS cr.: 10 hours lessons and independent work approx. 16 hours. 2 ECTS cr.: 18 hours lessons and independent work approx. 34 hours. Group B: Deutsch und Energie	

Evaluation	Contact lessons 28, independent work approx. 24 hours. Successfully completed written and spoken assignments or written and oral test. Continuous assessment requires 75% attendance and active participation.
Study materials	Group C: Deutsch im Maschinenbau Contact lessons 14, independent work (online) approx. 38 hours. 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. Groups A, B, C: Pass/Fail.
Prerequisites	Group A: Structural Materials: 1 ECTS cr.: Assignments given in the course BK20A2100 Structural Materials and some additional assignments in German. 2 ECTS cr.: Assignments given in the course BK20A2100 Structural Materials and additional assignments in German. Group B: Deutsch und Energie Material provided by the teacher. Group C: Deutsch im Maschinenbau Online material and exercises: http://www.uni-tuebingen.de/ael/deuma/deuma_overview.htm
Further Information	Group A: Structural Materials 1 ECTS cr.: No knowledge in German necessary. 2 ECTS cr.: Courses at the level A2 or equivalent skills. Group B: Deutsch und Energie and Group C: Deutsch im Maschinenbau Courses at the level A2 or equivalent skills. This course has 11-15 places for open university students. More information on the web site for open university instruction.

FV12A7113	BUSINESS GERMAN	4 ECTS cr
	Wirtschaftsdeutsch	
	The course will be lectured every other year, next during the academic year 2011 - 2012.	
Year and Period	Period 3-4	
Teacher(s)	Lecturer, M.A. Pirjo Rantonen	
CEF Level	Teaching level B1.	
Aims	By the end of the course, students will be expected to be able to tell about a company and its activity, company strategies and corporate finance.	
Content	Fields: company forms, lines of business, business organization, company strategies, annual reports, describing development, business cycles. Grammar: passive voice, the use of verbs and nouns (stylistics), verbs with prepositions. 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. Individual, pair and group work. Contact lessons 28 (period 3), independent work approx. 76 hours. Continuous assessment and successfully completed written and oral assignments or a written and oral test. Continuous assessment requires 75% attendance and active participation. Students who have taken the course FV12A7600 Wirtschaftssprache Deutsch, FV12A7120 Wirtschaft 2: Unternehmen or FV12A5400 Selbststudiumkurs Wirtschaft are not eligible for this course because of the similar contents of the courses.	
Evaluation	Pass/Fail.	
Study materials	Provided by the teacher and on the web.	
Prerequisites	Courses at the level A2 or equivalent skills.	

Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	
FV14A1200	RUSSIAN 1	3 ECTS cr
	Venäjän 1, Русский язык 1	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 1-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1-2, 3-4	
Teacher(s)	Lecturer, B.A. Natalia Kurilova Part-time Untenured Teacher, N. N.	
CEF Level	Entry level: 0, target level: A1.	
Aims	By the end of the course, students will be able to use basic structures, vocabulary and polite phrases needed in everyday communication.	
Content	Grammatical structures: gender and plural of nouns and adjectives, possessive pronouns, verb conjugation, cases (nominative, prepositional, accusative, dative), numerals. Situations: getting to know people, description of apartment, introducing oneself, and meals. Pronunciation. Learning the alphabet.	
Modes of Study	Languages of instruction: Finnish, Russian and English. Exercises that support communication skills, some online and in Blackboard. Contact hours 48 (24+24), independent work approx. 30 h. The course can be completed in two ways: 1) 50% attendance and active participation in lectures, which replaces part of the written exam, or 2) Possibility for independent study: a written examination required for a passing grade. Use for this information the section marked "Further information" in the WebOodi enrollment.	
Evaluation	Pass/Fail.	
Study materials	Marja Jegorenkov, Sirpa Piispanen, Tuula Väisänen: <i>Možno!</i> 1 Venäjän alkeiskurssi. Blackboard.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
FV14A1400	RUSSIAN 2	3 ECTS cr
	Venäjän 2, Русский язык 2	
Year and Period	Period 1-2, 3-4	
Teacher(s)	Lecturer, B.A. Natalia Kurilova	
CEF Level	Target level: A1.	
Aims	By the end of the course, students will have expanded the vocabulary they use in everyday situations, will know the basic Russian grammatical structures and will become familiar and be able to apply different features of Russian culture in various communication situations.	
Content	Situations: travelling, society and culture, correspondence, hobbies, dining, shopping. Grammar: prepositions, past tense of the verbs and aspects, singular nouns in cases (genitive, instrumental), pronouns, plural adjectives in nominative case. Languages of instruction: Russian, Finnish and English.	
Modes of Study	Exercises that support communication skills, some online and in Blackboard. Contact hours 48 (24+24). Independent work 30 h. The course can be completed in two ways: 1) 50% attendance and active participation in lectures, which replaces part of the written exam, or 2) possibility for independent study: a written examination required for a passing grade. Use for this information the section marked "Further information" in the WebOodi enrollment.	
Evaluation	Pass/Fail.	
Study materials	Marja Jegorenkov, Sirpa Piispanen, Tuula Väisänen: <i>Možno!</i> 1 Venäjän alkeiskurssi	

Prerequisites	Russian 1 or equivalent skills.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
FV15A1210	BASIC COURSE IN FRENCH 1	2 ECTS cr
	Ranskan peruskurssi 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, M.A. Vuokko Paakkonen	
CEF Level	Entry level: 0, target level: A1	
Aims	By the end of the course, students are expected 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 and 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 28, independent study approx. 24 hours.	
Evaluation	Written examination and successfully completed written assignments. 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. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade. Pass/Fail. Written exam and written assignments 50%, oral test or continuous evaluation 50%.	
Study materials	Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express, units 1 - 3.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	
FV15A1220	BASIC COURSE IN FRENCH 2	2 ECTS cr
	Ranskan peruskurssi 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, M.A. David Erent Lecturer, M.A. Vuokko Paakkonen	
CEF Level	Entry level: A1.1, target level: A1.2	
Aims	By the end of the course, students are expected 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 and 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, going to restaurant, talking about food, communication on the phone and by e-mail. Structures: articles, personal pronouns, verbs in the future tense, passé composé, construction and placement of adjectives, prepositions of location, prepositions à and de. Languages of instruction: French, Finnish and English.	

Modes of Study	Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. Written examination and successfully completed written assignments. 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. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade.
Evaluation	Pass/Fail. Written exam and written assignments 50%, oral test or continuous evaluation 50%
Study materials Further Information	Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 1, units 4 - 6. This course has 6-10 places for open university students. More information on the web site for open university instruction.

<i>FV15A1410</i>	<i>INTERMEDIATE COURSE IN FRENCH 1</i>	<i>2 ECTS cr</i>
	Ranskan jatkokurssi 1	
Year and Period Teacher(s)	Period 1, 3 Lecturer, M.A. David Erent Lecturer, M.A. Vuokko Paakkonen	
CEF Level Aims	Entry level: A1.2, target level: A2.1 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 and to understand and apply the most important French customs.	
Content	Communication: shopping, talking about work, the working place and conditions, presenting a company (very briefly), talking about products, 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 28, independent study approx. 24 hours. Written examination and successfully completed written assignments. 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. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade.	
Evaluation	Pass/Fail. Written examination and written assignments 50%, oral test or continuous assessment 50%	
Study materials Prerequisites Further Information	Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 1, units 6 - 8. French 1 or equivalent skills. This course has 6-10 places for open university students. More information on the web site for open university instruction.	

<i>FV15A1420</i>	<i>INTERMEDIATE COURSE IN FRENCH 2</i>	<i>2 ECTS cr</i>
	Ranskan jatkokurssi 2	
Year and Period Teacher(s)	Period 2, 4 Lecturer, M.A. David Erent Lecturer, M.A. Vuokko Paakkonen	
CEF Level Aims	Entry level: A2.1, target level: A2.2 By the end of the course, students are expected to cope in situations practiced	

Content	during the course, to be able to discuss topics introduced during the course using simple phrases, 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 and to understand and apply the most important French customs.
Modes of Study	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 the bank, going to a doctor, describing people, talking about the past and future. Structures: articles, imperfect and passé composé, future, conditional, imperative, objects of personal pronouns, relative pronouns. Languages of instruction: French, Finnish and English. Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. Written examination and successfully completed written assignments. 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. Possibility for independent study: successfully completed written assignments, a written examination and an oral test required for a passing grade.
Evaluation	Pass/Fail. Written examination and written assignments 50%, oral test or continuous assessment 50%.
Study materials Further Information	Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express 1, units 8 - 10. This course has 6-10 places for open university students. More information on the web site for open university instruction.

<i>FV15A5301</i>	<i>FRENCH FOR ECONOMY AND BUSINESS</i>	<i>3 ECTS cr</i>
	Français de la vie économique et professionnelle	
Year and Period	Period 3	
Teacher(s)	Lecturer, M.A. David Erent	
CEF Level	Entry level: A2.2, target level: B1.1	
Aims	After completing the course the student is expected to be able to deal verbally and in writing with the technical, working life and economy-related situations addressed in class.	
Content	Communication: describing tasks, processes, projects and action plans; describing organizations, products and services; reporting faults and addressing problems; conducting meetings; explaining and clarifying; talking about past and future events; handling marketing communication; communicating by telephone and e-mail. Structures: articles, prepositions, pronouns, present, passé composé and imparfait, future tense and conditional, subjunctive, direct and reported speech, adverb clauses of cause, adverb clauses of time.	
Modes of Study	Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. Written examination and successfully completed written assignments. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.	
Evaluation	Pass / Fail Written test and successfully completed written assignments 50%, oral test or continuous evaluation 50%.	
Study materials	Provided by the teacher.	
Prerequisites	FV15A1420 Intermediate Course in French 2 or equivalent level of proficiency.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

<i>FV15A6003</i>	<i>INTERCULTURAL COURSE IN FRENCH</i>	<i>4 ECTS cr</i>
	Cours interculturel	
	This course is suitable for French students, as well.	
Year and Period	Period 4	
Teacher(s)	Lecturer, M.A. 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, and 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 the 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 and 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. 76 hours. Approved exercises and continuous assessment, requires 75% attendance and active participation.	
Evaluation	Pass/Fail.	
Study materials	Provided by the teacher and the students.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
<i>FV15A9301</i>	<i>FRENCH INDEPENDENT STUDY</i>	<i>1 - 4 ECTS cr</i>
	Ranskan itseopiskelukurssi tekniikan ja kauppatieteiden opiskelijoille	
Year and Period	Period 1-2, 3-4, 5	
Teacher(s)	Lecturer, M.A. Vuokko Paakkonen	
CEF Level	Entry level: B1	
Aims	By the end of the course, students must demonstrate having improved their independent study skills and 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, Finnish or English.	
Modes of Study	Independent work following an individual study plan, approximately 26 - 104 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.	
Evaluation	Pass/Fail based on assignments and a learning journal.	
Study materials	Chosen by the student.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	
<i>FV16A1210</i>	<i>BASIC COURSE IN SPANISH 1</i>	<i>2 ECTS cr</i>
	Espanjan peruskurssi 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, M.A. Sari Pärssinen	
CEF Level	Entry level: 0	
Aims	By the end of the course, students are expected to be able to use simple	

Content	structures and vocabulary in presentations both in studies and in the world of work and to introduce themselves both orally and in writing.
Modes of Study	Introducing oneself, professions, presentations, hobbies. Structures: pronouns, nouns, adjectives and verbs in the present tense. Languages of instruction: Finnish and Spanish. Exercises that support communication skills. Contact hours 28, independent study approx. 24 hours. Written examination.
Evaluation	Students who have passed the course FV16A1200 Spanish 1 are not eligible for this course because of the similar contents of the courses.
Study materials	Possibility for independent study: a written examination required for a passing grade. Pass/Fail. Es español (units 1 - 3) Blackboard: "Recursos en español"
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

<i>FV16A1220</i>	<i>BASIC COURSE IN SPANISH 2</i>	<i>2 ECTS cr</i>
	Espanjan peruskurssi 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, M.A. 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 ask for directions, and 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. Written examination. Students who have passed the course FV16A1200 Spanish 1 are not eligible for this course because of the similar contents of the courses. Possibility for independent study: a written examination required for a passing grade.	
Evaluation	Pass/Fail.	
Study materials	Es español (units 4 - 6). Blackboard: "Recursos en español"	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

<i>FV16A1410</i>	<i>INTERMEDIATE COURSE IN SPANISH 1</i>	<i>2 ECTS cr</i>
	Espanjan jatkokurssi 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, M.A. 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 and 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. Structures: pronouns, gerund, reflexive verbs, adverbs, perfect tense. Languages of instruction: Finnish and Spanish.	

Modes of Study	Exercises that support communication skills. Contact lessons 28, independent study approx. 24 hours. Written examination. Oral test or grade based on continuous assessment. 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. Possibility for independent study: a written examination and an oral test required for a passing grade.
Evaluation	Pass/Fail.
Study materials	Es español (units 7 - 9). Blackboard: "Recursos en español"
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

<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, M.A. 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 and 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. Written examination. Oral test or grade based on continuous assessment. 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. Possibility for independent study: a written examination and an oral test required for a passing grade.	
Evaluation	Pass/Fail.	
Study materials	Es español (units 10 - 12). Blackboard: "Recursos en español"	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	

<i>FV16A1602</i>	<i>SPANISH FOR WORKING LIFE</i>	<i>3 ECTS cr</i>
	Työelämän espanjaa	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, M.A. Sari Pärssinen	
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. Languages of instruction: Finnish and Spanish.	
Modes of Study	Exercises that support communication skills. Contact lessons 28, independent study approx. 50 hours. Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Possibility for independent study: a written examination and an oral test required for a passing grade.	

Evaluation	Pass/Fail.
Study materials	Socios 2 (units 1 - 5). Blackboard: "Recursos en español"
Prerequisites	FV16A1420 Intermediate Course in Spanish 2, FV16A1400 Spanish 2 or equivalent skills.
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.

FV16A3201	BUSINESS SPANISH	3 ECTS cr
	Español de negocios	
Year and Period	Period 1	
Teacher(s)	Lecturer, M.A. Sari Pärssinen	
CEF Level	Entry level: A2.2	
Aims	By the end of the course, students are expected to be able to communicate in Spanish in basic business situations, to understand the business culture of the Spanish speaking countries and to present and market products.	
Content	Business culture, products, marketing, business communication in the Spanish-speaking world. Grammar contents: conditional, advanced subjunctive, indirect speech. 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.	
	The grade will be based either on the continuous evaluation of students or a written test plus the completion of some oral exercises. This will be agreed with the teacher at the beginning of the course.	
	The course can also be carried out in a Spanish-speaking country by completing assignments given in advance by the teacher.	
Evaluation	Pass / Fail.	
Study materials	Socios 2 (units 6 - 11). Blackboard: "Recursos en español".	
Prerequisites	Spanish for Working Life or equivalent skills.	
Further Information	This course has 6-10 places for open university students. More information on the web site for open university instruction.	

FV16A5202	INTERCULTURAL SPANISH COURSE	4 ECTS cr
	Curso intercultural entre Finlandia y España	
	The course will be lectured every other year, next during the academic year 2012 - 2013.	
Teacher(s)	Lecturer, M.A. Sari Pärssinen	
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. Language of instruction: Spanish.	
Modes of Study	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 the Finnish and Spanish cultures. Contact lessons 28, independent study approx. 76 hours.	
	Continuous assessment (requires 75% attendance and active participation).	
Evaluation	Pass/Fail.	
Study materials	Handouts in class.	

Prerequisites	Blackboard: "Recursos en español".
Further Information	Spanish for Working Life or equivalent skills. This course has 6-10 places for open university students. More information on the web site for open university instruction.

FV18A9101	FINNISH 1	2 ECTS cr
	Finnish 1	
Year and Period	Period 1, 3	
Teacher(s)	Lecturer, M.A. Elina Häkkinen	
CEF Level	A1.1	
Aims	After the course students are expected to be able to tell about themselves in Finnish using very simple expressions, to use simple Finnish everyday phrases, to understand a very simple and slow Finnish conversation about topics dealt with during the course, to understand the main contents of a very simple text on concrete topics with the help of a dictionary, and to write very simple sentences on course topics with the help of a dictionary.	
Content	Topics: greeting people, introducing oneself, asking simple questions, telling about one's plans and schedules, asking for the price, grocery shopping, family, telling 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 supports learning to communicate in Finnish. Contact lessons 28, homework approximately 24 hours. A written examination.	
Evaluation	Pass/Fail.	
Study materials	Course material booklet (in Noppa) and handouts given in class.	
Prerequisites	No previous knowledge of the Finnish language is expected.	

FV18A9201	FINNISH 2	2 ECTS cr
	Finnish 2	
Year and Period	Period 2, 4	
Teacher(s)	Lecturer, M.A. Elina Häkkinen	
CEF Level	A1.1	
Aims	By the end of the course, students are expected to be able to 1. take part in very simple and slow conversations 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, clothes, weather, seasons, hobbies, telling what you like, asking for directions. Grammar: locative cases, postpositions, object cases, 3rd infinitive, singular imperative, past tense.	
Modes of Study	Languages of instruction: Finnish and English. Simple written texts and tasks 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, and through other similar activities. Contact lessons 28, homework approximately 24 hours. A written examination.	
Evaluation	Pass/Fail.	
Study materials	Course material booklet (in Noppa) and handouts given in class.	
Prerequisites	Finnish 1 or equivalent knowledge.	

FV18A9301	FINNISH 3	2 ECTS cr
	Finnish 3	
Year and Period	Period 3-4	
Teacher(s)	Lecturer, M.A. Elina Häkkinen	
CEF Level	A1.2	
Aims	By the end of the course, students are expected to be able to discuss simple issues that are dealt with during the course, talk about the past more elaborately, cope orally in a simple situation involving health care, and understand the main contents of a simple newspaper article on concrete topic with the help of a dictionary, understand and write short and simple e-mails.	
Content	Topics: profession and work, living-related and household issues, opinions, emotions, health, phone conversations, simple e-mails. Grammar: present perfect tense, translative, essive, expressing necessity, more advanced sentence types, adjective comparison, some pronouns, conjunctions.	
Modes of Study	Languages of instruction: Finnish and English. Texts and tasks 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	Course material booklet (in Noppa) and handouts given in class.	
Prerequisites	Finnish 1 and 2 or equivalent knowledge.	
Further Information	This course has 1-5 places for open university students. More information on the web site for open university instruction.	
FV19A1000	CHINESE 1	3 ECTS cr
	Chinese 1	
Year and Period	Period 1-2, 3-4	
Teacher(s)	Part-time Untenured Teacher, Matina Ma	
CEF Level	A1	
Aims	By the end of the course students should be able to pass the New HSK (Level I). Students are expected to understand and use very simple Chinese phrases, meet basic needs for communication and possess the ability to further their Chinese language studies. These students should master 150 commonly used words and basic grammar patterns.	
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 individual self and family.	
Modes of Study	Language of instruction: Mandarin Chinese, Finnish and English. 56 contact lessons, meeting twice a week. 75% attendance is required. Students who do not meet the attendance requirement but have finished all of the assignments may still receive a grade if they sit the final exam, which is an essay written in Chinese or an exam in speaking, listening and reading.	
Evaluation	0 - 5. Exams (60%) and continuous assessment (40%).	
Study materials	Provided by the teacher (Handouts, worksheets, flash files, audio files, New HSK level 1's mock paper and references)	
Prerequisites	The course is meant for beginners.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

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	A2	
Aims	By the end of the course students are expected to 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 and be able to speak about simple topics.	
Content	Topics include travelling and shopping in Chinese communities, personal information, Chinese typing, cover letter and curriculum vitae, daily schedule, family and hobbies.	
Modes of Study	Language of instruction: Mandarin Chinese, Finnish and English. 56 contact lessons, meeting twice a week. 75% attendance is required. Students who do not meet the attendance requirement but have finished all of the assignments may still receive a grade if they sit the final exam, which is an essay written in Chinese or an exam in speaking, listening and reading.	
Evaluation	0 - 5. Exams (60%) and continuous assessment (40%).	
Study materials	Provided by the teacher (Handouts, worksheets, video & audio files, and references).	
Prerequisites	Successful completion of FV19A1000 Chinese 1 or equivalent skills.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

FV19A3500	BUSINESS CHINESE	3 ECTS cr
	Business Chinese	
Year and Period	Period 1-2, 3-4	
Teacher(s)	Part-time Untenured Teacher, Matina Ma	
CEF Level	B1	
Aims	By the end of the course students should be able to pass the Business Chinese Test (BCT Certificate Level 2's Listening and Reading). Students are expected to be capable of basic communication in Chinese in business activities.	
Content	Topics including figures and numbers, comparison of difference in degree and amount, personal information and occupation, business speech in negotiation, Chinese typing, business E-mail and general business Chinese terminologies.	
Modes of Study	Language of instruction: Mandarin Chinese and English. 56 contact lessons, meeting twice a week. 75% attendance is required. Students who do not meet the attendance requirement but have finished all of the assignments may still receive a grade if they sit the final exam, which is an essay written in Chinese or an exam in speaking, listening and reading.	
Evaluation	0 - 5. Exams (60%) and continuous assessment (40%).	
Study materials	Provided by the teacher (Handouts, worksheets, audio files and references).	
Prerequisites	Business Chinese is intended for students who have studied relevant Business Chinese course or have studied Chinese 2 for a semester with 2-3 class hours in each week.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

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	B1	
Aims	By the end of the course students should be able to pass the New HSK (Level II). Students are expected to communicate in Chinese at a basic level in their daily and working lives and to manage most communication in Chinese when travelling in China as well. These students should master 600 commonly used words and related grammar patterns.	
Content	Topics include life in Chinese communities, traveling, shopping, accommodation, Chinese cuisine, entertainment, introduction of essential Chinese customs and Chinese festivals. Language of instruction: Mandarin Chinese and English.	
Modes of Study	56 contact hours, meeting twice a week. 75% attendance is required. Students who do not meet the attendance requirement but have finished all of the assignments may still receive a grade if they sit the final exam, which is an essay written in Chinese or an exam in speaking, listening and reading.	
Evaluation	0 - 5. Exams (60%) and continuous assessment (40%).	
Study materials	Provided by the teacher (Handouts, worksheets, video files, New HSK level 2's mock paper and references).	
Prerequisites	Successful completion of FV19A2000 Chinese 2 or equivalent skills.	
Further Information	This course has 11-15 places for open university students. More information on the web site for open university instruction.	

9. Minor Subjects in English

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

The minor subjects taught in English at LUT are:

Faculty of Technology

Modelling of Energy Systems 21 ECTS

<i>Obligatory Studies (21 op)</i>		<i>vsk</i>	<i>per.</i>	<i>op</i>
BH40A1500	Turbulence Models	DI 2	3-4	4
BH70A0001	Numerical Methods in Heat Transfer	DI 1	1-2	6
BH70A0101	Advanced Modeling Tools For Transport Phenomena	DI 1	3-4	5
BH70A0200	Advanced Topics in Modelling of Energy Systems	DI 1	1-2	6

Industrial Embedded Systems, 21 ECTS

<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

Power Electronics and Electrical Drives, min 20 ECTS

<i>Select a minimum of 20 ECTS cr</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
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

Bio-Energy Technology, 22 ECTS

<i>Obligatory Studies (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.) 2	1-2	6
BH50A1600	Waste Heat Recovery Techniques	M.Sc. (Tech.) 2	3-4	6
BH50A1500	Bioenergy Technology Solutions	M.Sc. (Tech.) 1	2-3	6

Environmental Energy Technology, 22 ECTS

<i>Obligatory Studies (22 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
BH60A2101	Advanced Course in Life Cycle Assessment	M.Sc. (Tech.) 2	1-2	7
BH60A2200	Air Pollution Control	M.Sc. (Tech.) 1	3-4	3
BH60A2401	Energy Recovery from Solid Waste	M.Sc. (Tech.) 2	1-2	4

Advanced Design Methodology, 20 ECTS

<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	1	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

Chemical Engineering, min 20 ECTS

<i>Obligatory for all</i>		<i>per.</i>	<i>ECTS cr</i>
BJ20A1600 ¹⁾	Chemical Engineering Unit Operations I	1-2	4

¹⁾ Available as a book exam: Coulson&Richardson, Chemical Engineering (specified sections)

<i>Obligatory Studies, choose one course:</i>		<i>per.</i>	<i>ECTS cr</i>
BJ30A0600	Modelling of Unit Processes	3-4	6
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	1	6
BJ30A1600	Advanced Process Simulation	3-4	8
BM20A3900	Modelling Methodology in Process Engineering	1-2	6

<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
BJ20A1801	Chemical Engineering Unit Operations II	1-2	5
BJ20A1901	Advanced Course in Environmental Technology and Unit Operations	3-4,1	6

Packaging Technology, 22 ECTS

<i>Obligatory Studies (22 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
BK20A1300	Packaging Materials	1-2	4
BK20A1500	Principles of Chemistry, Paper Technology and Food Technology	1-4	5
BK50A1401	Packaging Lines and Machinery	3-4	7
BK50A2100	Printing and Package Design	1-2	6

Manufacturing, 21 ECTS

<i>Obligatory Studies (21 ECTS cr)</i>		<i>per.</i>	<i>op</i>
BK20A0100	Materials Science	1-2	6
BK20A2200	Basics of Welding Technology	2	3
BK30A0600	Laser Based Products and Production Technology	3-4	5
BK50A0700	Advanced Production Engineering	1-2	7

Design, 24 ECTS

<i>Obligatory Studies (24 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
BK50A2200	Design Methodologies and Applications of Machine Element Design	3-4	5
BK60A0301	Servo Control Engineering	1-2	8
BK70A0000	Simulation of a Mechatronic Machine	3-4	6
BK80A1200	FE-analysis course	3-4	5

Technomathematics, min 20 ECTS

<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

BM20A2102	Differential Equations	3	6
BM20A2201	Logic and Discrete Methods	1-4	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
BM20A3202	Fuzzy Engineering	3-4	6
BM20A3301	Stochastic Theory and Models	4	3-5
BM20A3401	Design of Experiments	4	4
BM20A3602	Fuzzy Data Analysis	3	6
BM20A3801	Advanced Mathematical Methods	1-4	3-6
BM20A3900	Modelling Methodology in Process Engineering	1-2	6
BM20A4201	Applied Functional Analysis	2-3	4-6
BM20A4500	Evolutionary Computation	2	5
BM20A5000	Principles of Technical Computing and Scientific Publishing	1-2	4

Technical Physics, min 20 ECTS

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

^t) Choose a min. of two courses.

Bioenergy 25 ECTS, only for students of School of Business

<i>Obligatory Studies (25 ECTS cr)</i>		<i>year</i>	<i>per.</i>	<i>ECTS cr</i>
BH40A1301	Power Machines 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
BH61A0600	Bioenergy	M.Sc. (Tech.) 1	1	3

Faculty of Technology Management:

Business and Technology in Russia 20/25 ECTS

<i>Elective Studies</i>		<i>per.</i>	<i>ECTS cr</i>
A220A0150	International Finance and Emerging Markets	2	6
A350A0150	Corporate Strategy for Emerging Markets	3	6
BJ40A0300	Management of Technical Information in Export of Processing Equipment to Russian Federation	Intensive	5
BH60A2800	Energy and Environmental Challenges in Russia	3	5
CS10A0751	Enterprises and Competition in Russia	3	6
CS10A0800	The Basics of Doing Business in Russia	2	5
FV14A1200 ⁽¹⁾	Venäjä 1	1-2, 3-4	3
FV14A1400 ⁽¹⁾	Venäjä 2	1-2, 3-4	3
FV14A1801 ⁽¹⁾	Venäjän sijamuodot	3-4	3
FV14A4200 ⁽¹⁾	Nykyvenäjän kieltä ja maantuntemusta	1-2	3

⁽¹⁾) Exchangeable

^(*)) Only one Russian language course can be included to the minor. Language courses are alternative to each other and should be selected according to the student's language skills.

The minor is intended for students from all the Master Programmes in Lappeenranta University of Technology and focuses on Russian market. The minor is organized in cooperation with all the three faculties of Lappeenranta University of Technology.

Student should select courses from the list above so that the required amount of ECTS credits will be fulfilled. Only one Russian language course can be included in the minor; however language course is not obligatory.

Russia and Transitional Economies: Business Environment 20 or 25 ECTS cr

<i>Elective Studies</i>		<i>per.</i>	<i>ECTS cr</i>
CS10A0550	International Business Methods	1-2	7
CS10A0651	Management of Innovations in Russia	4	5
CS10A0751	Enterprises and Competition in Russia	3	6
CS10A0800	The Basics of Doing Business in Russia	2	5
CS10A0852	European Union – Competitiveness and Enlargement	4	5

Minor: Business Technology

<i>Obligatory studies (min 22 ECTS cr)</i>		<i>per.</i>	<i>ECTS cr</i>
CS20A6060	Introduction to Logistics	1	5
CS35A0151	Product Lifecycle Management	4 int.	7
CT60A4101	Software Engineering Methods	1-2	5
*CT60A5000	E-Business Technologies	3-4	5

* Lectured every other year, next 2011-2012

Intelligent Computing. Recommended for Technomathematics Students only

<i>Choose minimum 20 ECTS 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 min 20 ECTS cr

<i>Electives, min. 20 ects credits should be selected</i>		<i>per.</i>	<i>ECTS cr</i>
A380A6000	Cross-Cultural Encounters*	3	3
A380A6050	Introduction to International Business and Planning	1, int.	3
A350A0300	Technology and Innovation Management	2	6
A380A0000	Cross-Cultural Issues in International Business*	2	6
A380A0200	Promotion and Sales Management	4	6
A380A0050	Global Sourcing	3-4	6
A350A0150	Corporate Strategy for Emerging Markets	3	6

*Choose one of these courses

10. University Administration and Professors

University senate

The university senate is the university's highest decision-making body. The duties of the senate are defined in the Universities Act and LUT's administrative regulations. The senate members are listed on the university web site.

Rector, vice-rectors and director of administration

The rector of the university is Professor Ilkka Pöyhönen. The rector manages the activity of the university.

The first vice-rector, Professor Hannu Rantanen, is responsible for education. The second vice-rector, Professor Veli-Matti Virolainen, is in charge of research, and the third vice-rector, Professor Minna Martikainen, of international affairs. 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 Vesa Harmaakorpi
- 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 2011)

FACULTY OF TECHNOLOGY

Faculty of Technology

D.Sc.(Tech.)	Marttila, Esa	Environmental Technology	1.1.2010	
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LUT Energy

D.Sc.(Tech.)	Ahola, Jero	Energy efficiency and maintenance of electrical drives	1.1.2010	31.8.2014
D.Sc.(Tech.)	Backman, Jari	Applied fluid dynamics in renewable energy systems	1.1.2010	16.12.2014
D.Sc.(Tech.)	Horttanainen, Mika	Environmental technology, esp. waste management technology and the energy recovery of waste	1.4.2010	
D.Sc.(Tech.)	Hyppänen, Timo	Modelling of energy conversion systems	1.1.2010	30.9.2012
D.Sc.(Tech.)	Kyrki-Rajamäki, Riitta	Nuclear engineering	1.1.2010	
D.Sc.(Tech.)	Larjola, Jaakko	Fluid dynamics	1.1.2010	

D.Sc.(Econ.& Bus.Adm.)	Linnanen, Lassi	Environmental technology, environmental management	1.1.2010	
D.Sc.	Mityakov, Andrey		3.3.2011	31.12.2011
D.Sc.(Tech.)	Partanen, Jarmo	Electrical engineering	1.1.2010	
D.Sc.(Tech.)	Pyrhönen, Juha	Electrical drives technology	1.1.2010	
D.Sc.(Tech.)	Pyrhönen, Olli	Wind technology	1.1.2010	
D.Sc.(Tech.)	Ranta, Tapio	Bioenergy economics	1.1.2011	31.12.2011
D.Sc.(Tech.)	Sillanpää, Mika	Green chemistry	1.5.2011	
D.Sc.(Tech.)	Silventoinen, Pertti	Electronics	1.1.2010	
D.Sc.(Tech.)	Soukka, Risto	Environmental technology, especially life cycle modelling	1.9.2010	31.8.2015
D.Sc.(Tech.)	Vakkilainen, Esa	Renewable energy systems, especially energy conversion processes of biomass, and energy efficiency	1.1.2010	30.9.2014
D.Sc.(Tech.)	Viljainen, Satu	Electrical power systems, esp. the electricity market	1.1.2010	31.7.2011
LUT Chemistry				
M.Sc.(Tech.)	Backfolk, Kaj	Biomaterials process technology	1.12.2010	30.11.2015
D.Sc.(Tech.)	Häkkinen, Antti	Solid-liquid separation	1.2.2011	31.12.2012
Ph.D.	Kraslawski, Andrzej	Process engineering, esp. technology based on innovative solutions	1.1.2010	
D.Sc.(Tech.)	Louhi-Kultanen, Marjatta	Chemical unit operations, esp. separation technology	1.1.2010	16.12.2014
D.Sc.(Tech.)	Mänttari, Mika	Membrane technology	1.11.2010	
D.Sc.(Tech.)	Paatero, Erkki	Chemical engineering	1.1.2010	
D.Phil.	Siren, Heli	Chemistry	1.1.2010	
D.Sc.(Tech.)	Turunen, Ilkka	Design of industrial processes	1.1.2010	
LUT Mechanical Engineering				
D.Sc.(Tech.)	Björk, Timo	Steel structures	1.3.2011	
Ph.D.	Cameron, David	Materials technology	1.1.2010	31.7.2011
D.Sc.(Tech.)	Kujanpää, Veli	Welding technology	1.1.2010	31.12.2011
D.Sc.(Tech.)	Kärki, Timo	Wood technology	1.1.2010	31.7.2011
D.Phil.	Lindell, Henry	Flexible packaging technologies	1.1.2010	31.7.2013
D.Sc.(Tech.)	Martikainen, Jukka	Welding technology	1.1.2010	
D.Sc.(Tech.)	Mikkola, Aki	Virtual design	1.1.2010	
D.Sc.(Tech.)	Pöyhönen, Ilkka	Wood technology	1.1.2010	
D.Sc.(Tech.)	Salminen, Antti	Mechanical engineering, esp. manufacturing technology	1.1.2010	31.12.2012
D.Sc.(Tech.)	Varis, Juha P.	Production engineering	1.1.2010	

Mathematics and Physics

D.Sc.(Tech.)	Alatalo, Matti	Mathematics	1.1.2011	
D.Phil.	Haario, Heikki	Applied mathematics	1.1.2010	
D.Phil.	Heiliö, Matti	Applied mathematics	1.1.2010	31.8.2011
D.Phil.	Hämäläinen, Jari	Applied mathematics	1.9.2010	31.8.2011
D.Phil.	Lähderanta, Erkki	Physics	1.1.2010	
D.Phil.	Tuuva, Tuure	Physics	1.9.2010	

CEID

D.Sc.(Tech.)	Handroos, Heikki	Machine Automation	1.1.2010	
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FACULTY OF TECHNOLOGY MANAGEMENT
LUT Information Technology

D.Sc.(Tech.)	Kerttula, Esa	Telematics	1.1.2010	30.4.2012
D.Sc.(Tech.)	Kyrki, Ville	Information technology, esp. intelligent robotic systems	1.1.2010	30.9.2014
D.Sc.(Tech.)	Kälviäinen, Heikki	Information processing	1.1.2010	
D.Sc.(Tech.)	Kämäräinen, Joni	Information society technologies	1.1.2010	30.9.2013
D.Sc.(Tech.)	Porras, Jari	Communications engineering	1.1.2010	
D.Phil.	Smolander, Kari	Software engineering, esp. software architectures	1.9.2010	

LUT Industrial Management

D.Sc.(Tech.)	Harmaakorpi, Vesa	Industrial management, esp. innovation systems	1.1.2010	
D.Sc.(Econ.& Bus.Adm.)	Hilmola, Olli-Pekka	Industrial management, esp. railway logistics	1.1.2010	31.3.2013
D.Sc.(Tech.)	Huiskonen, Janne	Industrial management, esp. supply chain management	1.11.2010	
D.Sc.(Tech.)	Jalkala, Anne	Industrial management, esp. industrial marketing	1.11.2010	31.10.2011
D.Sc.(Tech.)	Koivuniemi, Jouni	Industrial management, esp. service processes and networks	1.8.2010	31.12.2011
D.Sc.(Tech.)	Kärri, Timo	Industrial management, esp. cost management	1.8.2010	30.6.2012
D.Sc.(Tech.)	Kässi, Tuomo	Engineering and technology management	1.1.2010	
D.Sc.(Tech.)	Lampela, Hannele	Industrial management, esp. knowledge management	1.8.2010	30.6.2012
D.Sc.(Econ.& Bus.Adm.)	Lehtomaa, Ahti	Industrial management, esp. technological entrepreneurship	1.1.2010	
D.Sc.(Tech.)	Melkas, Helinä	Industrial management, esp. service innovations	1.5.2011	31.12.2013
D.Phil.	Miettinen, Asko	Industrial management, esp. technological entrepreneurship	1.8.2011	31.7.2011
D.Sc.(Tech.)	Pirttilä, Timo	Industrial management, esp. logistics	1.1.2010	
D.Sc.(Tech.)	Rantanen, Hannu	Industrial management, esp. engineering and technology management	1.1.2010	
D.Sc.(Tech.)	Salminen, Risto	Industrial management, esp. industrial marketing	1.1.2010	
D.Sc.(Tech.)	Torkkeli, Marko	Industrial management, esp. technology and business innovations	1.1.2010	31.5.2013
D.Sc.(Tech.)	Tuominen, Markku	Industrial management, esp. management information systems	1.1.2010	
D.Sc.(Tech.)	Uotila, Tuomo	Industrial management, esp. management of foresight knowledge	1.5.2011	31.3.2013
D.Sc.(Tech.)	Väätänen, Juha	Industrial management, esp. international operations and marketing in industrial enterprises	1.1.2010	31.7.2011

SCHOOL OF BUSINESS
School of Business, common activities

D.Sc.(Econ.& Bus.Adm.)	Ellonen, Hanna-Kaisa	Strategic management of innovations	1.11.2010	31.10.2015
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Department of Management and International Business

D.Sc.(Econ.& Bus.Adm.)	Aaltio, Iiris	Business administration, esp. management and organizations	1.1.2010	
D.Sc.(Tech.)	Asikainen, Sanna-Katriina	Business administration, international marketing	1.12.2010	
D.Sc.(Econ.& Bus.Adm.)	Blomqvist, Kirsimarja	Knowledge management	1.11.2010	
D.Sc.(Tech.)	Hallikas, Jukka	Supply management, esp. service innovations and service procurement	1.1.2011	31.12.2015
D.Sc.(Econ.& Bus.Adm.)	Heilmann, Pia		1.8.2010	30.6.2012
D.Sc.(Econ.& Bus.Adm.)	Jussila, Iiro	Management and organizations	1.9.2010	31.8.2015
D.Soc.Sc.	Juuti, Pauli	Management and organizations	1.1.2010	31.10.2011
D.Sc.(Econ.& Bus.Adm.)	Kianto, Aino		1.6.2011	31.10.2011
D.Sc.(Econ.& Bus.Adm.)	Kuivalainen, Olli	International marketing	1.1.2010	30.9.2014
D.Sc.(Econ.& Bus.Adm.)	Pihkala, Timo	Management and organizations, esp. entrepreneurship and SME management	1.1.2010	
D.Sc.(Econ.& Bus.Adm.)	Saarenketo, Sami	International marketing, esp. internationalization of SMEs	1.11.2010	
D.Sc.(Econ.& Bus.Adm.)	Sainio, Liisa-Maija	International marketing, esp. technology and innovation management	1.12.2010	30.11.2015
D.Sc.(Tech.)	Virolainen, Veli-Matti	Supply management	1.1.2010	

Department of Business Economics and Law

D.Sc.(Econ.& Bus.Adm.)	Jantunen, Ari	Strategy research	1.3.2011	
D.Sc.(Econ.& Bus.Adm.)	Kyläheiko, Kalevi	Business administration, esp. technology research	1.1.2010	
D.Sc.(Econ.& Bus.Adm.)	Martikainen, Minna	Finance	1.1.2010	
D.LL.	Niemi, Matti	Civil law	1.1.2010	
D.Sc.(Tech.)	Puumalainen, Kaisu	Technology research, esp. quantitative methods	1.1.2010	
D.Sc.(Econ.& Bus.Adm.)	Pätäri, Eero		1.8.2010	30.6.2012
D.Sc.(Econ.& Bus.Adm.)	Pätäri, Satu		1.1.2011	30.11.2012
D.Sc.(Tech.)	Sandström, Jaana	Strategic management accounting	1.4.2011	
D.Sc.(Econ.& Bus.Adm.)	Vaihekoski, Mika	Finance	1.1.2010	

11. Final thesis instructions

Approved by the vice-rector on 9 June 2010, enter into force 1 August 2010

Introduction

These instructions apply mainly to Master's theses at Lappeenranta University of Technology. They may also be used, where applicable, for Bachelor's theses and written assignments. The faculties may give more detailed instructions on the preparation of theses.

The instructions start with a process description of the practical aspects of starting a thesis and of its assessment. Then, the contents of the thesis, conducting research and research methodologies are discussed. The final section deals with layout and gives practical examples of it.

The Master's thesis is the final project of the Master's degree studies. It demonstrates the student's knowledge of a scientifically and/or societally important topic related to his or her professional field. The thesis is a research assignment that requires approximately six months of full-time work and amounts to 30 ECTS credits in the degree. The student must demonstrate the ability to carry out the project independently and following a plan.

The Master's thesis is prepared in the second year of the Master's degree studies, and before applying for the approval of their thesis topic, **students must have completed their Bachelor's degree or complementary studies.**

Final thesis process

Starting the work

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.

The following points are discussed with the professor:

- the prerequisites for starting the Master's thesis (completed studies)
- the topic and objective of the thesis
- applying for the thesis topic
- the preliminary research plan and schedule
- funding (by the student, a grant or an employer)
- the examiners of the thesis (the first examiner is the supervising professor or a docent from the student's degree programme)
- the supervisor from the commissioning organisation
- matters to be discussed with the community providing the funding and the supervisor representing it, such as the employment relationship, responsibilities, safety, insurances, invention rights, etc.
- publicity of the thesis

Applying for a topic

Prerequisites for applying for the approval of the thesis topic include:

- Bachelor's degree completed (when the student has been admitted into the university for both **Bachelor's and Master's studies**)
- possible complementary studies completed (if the student has been admitted to complete only the **Master's degree**)
- possible other requirements set by the faculty

The student applies for the approval of the topic and the appointment of the examiners from the head of the degree programme by leaving an application with the faculty study services.

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 approval of the topic remains in force for two years from the date of approval. When the head of the degree programme approves the thesis topic, he/she also appoints the first examiner for the thesis, who is an LUT professor or docent. The first examiner must be from the student's major subject or a closely related field. The first examiner is also the supervisor of the thesis at the university. The head of the degree programme also appoints a second examiner for the thesis based on the supervisor's proposal. The second examiner must have at least a higher university degree and may be from outside of the university. If one or both of the examiners change, this must be approved by the head of the degree programme.

In addition, the thesis may have a supervisor from the commissioning organisation, who is approved by the first examiner along with the thesis topic.

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 first examiner.

The topic application may be submitted when the required studies are completed and thesis work has been obtained from a company and discussed 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 stages of the topic application process and the forms to be filled out depend on the faculty. The forms and further information on the topic application process are available on the faculty web sites.

Publicity of the thesis**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**. However, it is recommended that the thesis is prepared as a public-access document.

If part of the information needs to be held confidential for longer than two years, the information must be excluded from the version submitted for examination. The work will be evaluated based on the non-confidential part.

The first examiner shall see to it that the commissioner is aware of the publicity requirements from the very beginning of the discussions.

Confidentiality notification

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 confidentiality period starts from the date the thesis is assessed. The student is responsible for submitting the confidentiality notification to the faculty no later than in connection with the assessment application. The faculty adds an indication of the possible confidentiality period after the thesis has been approved. The abstract is always public.

Maturity test

Students must complete a written maturity test on the topic of their thesis. Its purpose is to verify the student's familiarity with the topic of the thesis. During the course of the studies, also the student's Finnish or Swedish skills are assessed at one point. This can be done e.g. in connection with the Bachelor's thesis. The maturity test is assessed by the first examiner of the thesis, and as needed, also 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 another previous university degree, the language of the maturity test will not be evaluated, only the contents. The faculties issue their own instructions on the maturity test. Further information is available in the study guide of the LUT Language Centre.

The test should be written on a computer. For further information, please see <http://www.lut.fi/fi/lut/studies/origo/aquarium/Sivut/Default.aspx>.

The maturity test should be taken at least five weeks before graduation. The date and time for the test should be set together with the examiner and the person in charge of maturity tests in the faculty.

The examiner gives the topic of the test. The maturity test is evaluated on a scale of passed/failed.

Assessment of the Master's thesis

The thesis must be reviewed by the examiners before it is printed.

The student submits the Master's thesis in its final form, i.e. bound in black covers to the examiners for assessment. Both examiners are given their own copy (Bachelor's theses are not bound in black covers). The assessment application, abstracts in Finnish and English, the possible confidentiality notification of the commissioner, and copies bound in black covers are submitted to the faculty study services. Students of foreign nationality do not need to prepare an abstract in Finnish. **The faculty decides the graduation schedule and the number of bound copies submitted, and provides instructions on the evaluation.**

The examiners prepare a written statement on the thesis and propose a grade. The title and grade of the thesis are shown in the degree certificate.

Students of Master's programmes in English will be provided a statement in English on their Master's thesis.

The faculties determine the assessment criteria for final theses. Frequently applied criteria include e.g.

- The problem-setting, objectives, definitions and delimitations of the thesis
- The relationship to previous research
- The research approach, methods and material used in the work
- The schedule of the research and time management
- The results and their analysis
- The organisation and coherence of the work
- The profoundness of the work
- The reliability of the work
- The language and layout of the work
- An independent approach and application

A Master's thesis in technology is assessed on a scale of 1-5, where 1 is satisfactory, 2 is very satisfactory, 3 is good, 4 is very good and 5 is excellent. A Master's thesis in business is assessed on the scale *improbatur* (failed), *approbatur* (lowest passing grade), *lubenter approbatur*, *non sine laude approbatur*, *cum laude approbatur*, *magna cum laude approbatur*, *eximia cum laude approbatur* *sekä laudatur* (highest grade).

If the grade of the Master's thesis in technology is 5 or in business studies at least *eximia cum laude approbatur*, and the overall grade of the degree at least 4, the student has completed his or her degree **with distinction**.

The faculty assesses and approves the thesis after the student has submitted the bound copies and the assessment application to the faculty. **The forms and further information are available on the faculty web sites.**

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 services. 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 the grounds for giving 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 university Registrar's office.

Content of the thesis and how to conduct research

Language of the thesis

The thesis may 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. If the commissioner of the thesis requires the use of a language other than Finnish, the commissioner is responsible for the translation or language revision of the thesis. In degree or Master's programmes in English, the thesis is prepared in English and the author is responsible for revising the language.

Inventions related to the thesis

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). If the invention made in connection with the thesis is to be patented, the patent application must be left before the work is published. Otherwise, the thesis must be written so that the invention is not revealed.

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.

Contents of the thesis

The thesis may be composed e.g. of the following items in the following order (some apply only to the technology or the business thesis):

- Title page
- Abstract in Finnish
- Abstract in English
- Acknowledgements
- Table of contents
- List of symbols and abbreviations
- Introduction
- Discussion (theories, background and implementation of the research)

Conclusions (analysis of observations and results)

Summary (concise summary of the above)

References

Appendices

Title page

The title page includes the title of the thesis. The title must be well-defined and correspond to the content of the thesis. A keyword, 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 (one A4 sheet), objective, independent summary of the Master's thesis. It should be intelligible as such, without the original document. It explains the contents of the thesis: the objective, methodologies, results and conclusions. 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 is a public document, and therefore all confidential information must be excluded from it.

The abstract is prepared in Finnish and English. Both the Finnish and English abstracts are included in the thesis. The abstracts are also submitted to the faculty study affairs services as an annex to the assessment application of the thesis. Foreign nationals do not need to prepare an abstract in Finnish.

The author sends electronic copies of the abstracts or the entire thesis to the LUT library. More details are available from the library and its web site.

Acknowledgements

Acknowledgements are a brief description of what or who had an impact on the thesis. E.g. the people who furthered the progress of the thesis may be thanked.

Table of contents

The table of contents lists the headings and sub-headings and their page numbers.

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.

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 briefly describes the background, material extent and aims of the thesis. The introduction relates the thesis to other research and sources and presents the research methodology applied. It also describes the key points and organisation of the research report. It does not, however, include detailed descriptions of the theory, methods or results. A good introduction is, nevertheless, significantly longer than a couple of pages, and is organised in a logical manner.

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. However, 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.

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 e.g. tables. 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. The author must also explain under which conditions the calculations, formulae and equations are applicable.

Conclusions

Depending on the nature and scope of the study, the report ends either with the chapter "Conclusions", or two separate chapters, e.g. "Conclusions" and "Summary". The conclusions analyse the observations and results drawn from the research. The conclusions examine and reflect on e.g. the compatibility of the theory and measurements, the reasons for possible differences, and summarise the conclusions drawn from the results. The need for further research and possible practical applications may also be argued here.

Summary

The summary is a concise description of the entire work: it presents the starting point of the research, the theoretical and empirical choices, aims, results, conclusions and possible ideas for further research. No new information is introduced in the conclusions, and no direct references are made to the discussion. The importance of the summary should not be underestimated because often the reader only reads the summary or the introduction and the summary.

Carrying out the research

The thesis is to be prepared according to good scientific practice. The research methods must be approved by the scientific community. The prevailing approaches and research methods in the field in question are to be applied. The student should learn about the research methodology and practices in his/her field sufficiently before preparing the thesis.

Plagiarism is absolutely forbidden. Citations and references must be made in accordance with good practice. If plagiarism takes place in an assignment, seminar report, Bachelor's thesis or Master's thesis during the supervision process, the examiner must tell the student that it is unacceptable. The thesis must be supervised so that the final version does not include references that violate good scientific practice.

If, despite the examiner's efforts, the final version in the approval process contains plagiarised material, an assignment or report is failed, and a thesis is given a failing grade. Moreover, the matter will be brought before the director of administration.

Layout of the thesis

The presentation of the thesis is very important in terms of readability, intelligibility and reliability. A finished layout gives a good and reliable impression of both the work and its author. The thesis is written in standard language and in the passive voice. Abbreviations, such as *e.g.* or *etc.* should not be used, but instead, written out in their entirety.

Cover, presentation and electronic version

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 and run-on sentences. Buzzwords and unnecessary foreign words should be avoided in particular.

The Master's thesis is bound in black, hard covers, size A4. The university logo is not printed on the cover.

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.

The student submits the abstract of his or her thesis to the electronic database (LUTPub) maintained by the university library. Also the entire thesis may be uploaded into the database, in which case it can be accessed by the general public in an open network.

Layout of a Master's thesis in technology

On the **front cover**, printed in gold (*painokulta*), font Times, Arial 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).

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

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

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

- The recommended font is Times 12 or Arial 11, and the spacing 1.5.
- The thesis may be printed on both sides of the paper or on one side only.
- Page margins are as follows: 35 mm at the top, 30-50 mm on the left depending on how the thesis is bound, and in one-sided printing approx. 20 mm on the right and at the bottom.
- If you print on both sides of the paper, the outer margins should be approx. 20 mm and the inner ones approx. 50 mm.
- The page numbers are placed at the top of the page either centred or in the right-hand corner. In double-faced printing page numbering is either centred or in the outer corners.
- 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, depending on its nature and contents.

Layout of the Master's thesis in business

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.

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.

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

- The recommended font is Arial 12 and spacing 1.5.
- 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.
- 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.

Parts of the thesis

Title page

The title page is the first page of the thesis – page number 1. However, the page numbers are not shown before the first page of the table of contents. **The faculty decides on the information presented on the cover page. However, the following is always printed on it:**

- university, faculty, degree programme and/or major subject
- name of author
- title of thesis
- examiners (1st and 2nd)

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

An abstract is prepared on all Master's theses. 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 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 complete identification information should be included in the beginning of both the Finnish and the English abstract.

Author's name
 Title of thesis
 Faculty
 Degree programme and/or major subject
 Year of completion
 Master's Thesis University

Number of pages, figures, tables and appendices
 Examiners (1st and 2nd)
 Keywords in Finnish
 Keywords in English

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.

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).

Acknowledgements

The acknowledgements recognise the help, guidance, advice etc. provided by others and give thanks to them. Also the commissioner of the thesis is mentioned. The acknowledgements are concluded with the author's name and the date after which no more modifications have been made to the work.

Table of contents

The pages of the table of contents are numbered in Arabic numerals from where the text starts. **Please note that the first page (number 1) of the thesis is the title page.** Thus the table of contents may be e.g. on page 5. 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). **Please note that no more than three levels of headings are allowed.** If there is need for more detailed sub-headings, they should not be numbered. 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. The page numbers are aligned to the right.

1 INTRODUCTION	6
1.1 Background	6
1.2 Research problem, objectives and delimitation	9
1.3 Research methodology	11
1.4 Organisation of the study	13
2 HOW TO CREATE A COMPETITIVE EDGE	14
2.1 Starting point established by the transaction cost theory	14
2.2 Limitations of the transaction cost theory	16
2.3 Resources and competencies as the reason for competitive edge	18
--	
5 MANAGEMENT OF COOPERATION IN THE ICT SECTOR	63
5.1 Description of material and variables	63
5.1.1 Data collection	68
5.1.2 Descriptive information on the material	71
5.2 Testing of hypotheses	78
6 ANALYSIS OF RESULTS	80

7 CONCLUSIONS	87
8 SUMMARY	93
REFERENCES	96

APPENDICES

APPENDIX 1: Statistical results

APPENDIX 2: Companies interviewed

Discussion

Each citation in the discussion should be clearly referenced so that the reader may refer to the original source.

The nature of the work determines the formulation of the 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.

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.** The variables in the figures are presented in the same way as in the text and equations.

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

$$D_1 = \varepsilon E_1.$$

As in Equation (4) above, equations may be treated as elements of a sentence, which means punctuation, such as commas and periods, may also be used in connection with them.

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

Matrices may be treated as ordinary variables, in which case their symbols may be bolded, e.g. tension matrix \mathbf{U} . Equations may 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.

References

Listing references and the related ISO 690.2 and SFS 5342/1987 standards are presented in detail by Mälkiä (1994). In the commonly used 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 starting from the oldest one. 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. may be used instead of the author's name. Alternatively, the name of the publication may be used as the reference. Also unpublished reference material and important oral communications must be listed. The sources must be critically evaluated. The reference list must also indicate where rare and less known sources are available.

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.

Esimerkki, kun kirjoittajia on kaksi: Johnson, G. & Scholes, K. 1999. Exploring corporate strategy. 5th ed. Harlow: Prentice Hall

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: Santamaría, L., Neito, M.J. & Barge-Gil, A. 2009. Beyond Formal R&D: Taking Advantage of Other Sources of Innovation in Low- and Medium-Technology Industries. *Research Policy*, vol. 38, pp. 507-517.

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.

Electronic 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>

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 (e.g. two different authors cited in one paragraph), they should be separated with a semicolon and 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 may simply be marked: Ibid.

The instructions above are merely guidelines, they are not binding. Referencing may be done in another commonly approved way or following the examiners' instructions. The key to referencing is consistency.

Faculties may issue their own instructions for authors to follow. Authors must also take into account the requirements set by the language of the thesis.

Footnotes

Footnotes are only used for explanations and additional comments on the text and are numbered separately for each page. Footnotes are 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.

1.1.

1.2.

Appendices

Appendices may include equations, diagrams, drawings, forms, etc. that do not need to be included in the actual text but to which a reference is made. 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 appendices should not, however, contain anything irrelevant to the thesis.

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. 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.

REFERENCES

ISO 690-2:1997 Information and documentation—Bibliographic references—Part 2: Electronic documents or parts thereof

Mälkiä, M. 1994. Teksti ja kirjallisuusviitteiden laatiminen. 2nd unrevised ed. Tampere: University of Tampere. Hallintotiede B 6.

SFS 5342 Bibliographic references. 2nd ed. Helsinki: Finnish Standards Association. 1992.

SFS 5831 Bibliographic references. Electronic documents or parts there of. Helsinki: Finnish Standards Association. 1998.

Hannu Rantanen
Vice-rector

12. Master's thesis instructions in Business Administration

1. Introduction

These instructions apply only to business students and are based on LUT's university-wide thesis instructions. They were adopted on 1 August 2010. *This updated version will enter into force on 1 August 2011.*

The instructions start with a process description of the practical aspects of starting a thesis and of its assessment. Then, the contents of the thesis, conducting research and research methodologies are discussed. The final section deals with layout and gives practical examples of it.

The Master's thesis is the final project of the Master's degree studies. It demonstrates the student's knowledge of a scientifically and/or socially important topic related to his or her professional field. The thesis is a research assignment that requires approximately six months of full-time work and amounts to 30 ECTS credits in the degree. The student must demonstrate the ability to carry out the project independently and following a plan.

The Master's thesis is prepared in the second year of the Master's degree studies, and before applying for the approval of their thesis topic, **students must have completed their Bachelor's degree or complementary studies.**

2. Thesis process

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 or Master's programme). The student discusses the topic of the thesis with the professor to make sure it meets the scientific requirements for a Master's thesis.

The following points are discussed with the professor:

- the prerequisites for starting the Master's thesis (completed studies)
- the topic and objective of the thesis
- the preliminary research plan and schedule
- funding (by the student, a grant or an employer)
- the examiners of the thesis (the first examiner is the supervising professor or a docent from the student's degree programme)
- the supervisor from the company commissioning the thesis
- issues agreed on with the organisation funding the thesis and the supervisor from the organisation, such as the employment relationship, responsibilities, safety, insurances, invention rights, etc.
- public access to the thesis

Applying for a topic

Prerequisites for applying for the approval of the thesis topic:

- Bachelor's degree completed (when the student has been admitted into the university for both Bachelor's and Master's studies)
- possible complementary studies completed (if the student has been admitted to complete only the Master's degree)
- possible other requirements set by the faculty

The student applies for the approval of the topic and the appointment of the examiners from the head of the degree programme by leaving an application with the faculty study coordinator. The Master's thesis is related to the student's major subject/advanced studies and its topic is agreed on by the supervisor and the student together. The approval of the topic remains in force for two years from the date of approval. When the head of the degree programme approves the thesis topic, he/she also appoints the first examiner for the thesis, who is usually an LUT professor or docent.

The Master's thesis is supervised by a professor in the field with which the thesis deals. The first examiner is also the supervisor of the thesis at the university. The topic and research methods of the thesis are factors in the appointment of the supervisor and the second examiner. The head of the degree programme appoints a second examiner for the thesis based on the supervisor's proposal. The second examiner must have at least a higher university degree and may be from outside of the university. If one or both of the examiners change, this must be approved by the head of the degree programme.

In addition, the thesis may have a supervisor from the commissioning organisation, who is approved by the first examiner along with the thesis topic.

Research field	Professors
Supply Management	Veli-Matti Virolainen, Jukka Hallikas
Strategic Management of Innovations	Hanna-Kaisa Ellonen
Management and Organizations	Iiro Jussila, Pia Heilmann
International Marketing	Sami Saarenketo, Sanna-Katriina Asikainen, Olli Kuivalainen
International Marketing, especially technology and innovation management	Liisa-Maija Sainio
Accounting	Jaana Sandström, Satu Pätäri
Finance	Minna Martikainen, Eero Pätäri
Strategy Research	Kalevi Kyläheiko, Kaisu Puumalainen, Ari Jantunen
Science, Technology and Society Studies	Karl-Erik Michelsen
Knowledge Management	Kirsimarja Blomqvist, Aino Kianto
Entrepreneurship and Management of SMEs	Timo Pihkala
Business Law	Matti Niemi

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 supervising professor.

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. The title does not need to be finalised upon application; it may be modified during the course of the project.

The student may obtain his/her Bachelor's degree and have the thesis topic approved within the same month.

The forms and instructions for applying for the approval of the thesis topic are available on the web site of the School of Business: Opiskelu -> Nykyiset opiskelijat -> Pro gradu -tutkielman aiheen anominen.

Instructions for obtaining one's Bachelor's degree are available on the web site of the School of Business: Opiskelu -> Nykyiset opiskelijat -> Kandidaatiksi valmistuminen.

Public access to the thesis

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**. However, it is recommended that the thesis be prepared as a public-access document.

If part of the information needs to be held confidential for longer than two years, the information must be excluded from the version submitted for examination. The work will be evaluated based on the non-confidential part.

The first examiner shall see to it that the commissioner is aware of the publicity requirements from the very beginning of the discussions.

Confidentiality notification

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 confidentiality period starts from the date the thesis is assessed. The student is responsible for submitting the confidentiality notification to the faculty study coordinator in connection with the assessment application. The student includes the mention "Confidential" and the date the confidentiality expires in the lower right-hand corner of the title page of the thesis. The abstract is always public.

Maturity test

Students must complete a written maturity test on the topic of their thesis. Its purpose is to verify the student's familiarity with the topic of the thesis. During the course of the studies, also the student's Finnish or Swedish skills are assessed at one point. This can be done e.g. in connection with the Bachelor's thesis. The maturity test is assessed by the first examiner of the thesis, and as needed, also 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. In the School of Business, the test is then written in English (decision of the head of the degree programme, 28 October 2009).

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. The faculties issue their own instructions on the maturity test.

In such cases, the School of Business allows students to substitute the maturity test with a written assignment. The supervising professor of the thesis decides whether this approach can be taken. The supervisor and student agree on the matter in advance. Also in these cases, the supervisor forwards the result of the maturity test to the faculty office. (Decision of the head of the degree programme, 15 September 2010) Further information is available in the study guide of the LUT Language Centre.

The maturity test is taken on a computer in LUT Origo. For further information, please see Kauppatieteellinen tiedekunta -> Nykyiset opiskelijat -> Kypsyysnäytteen kirjoittaminen.

The maturity test must be taken five weeks before graduation. The date and time for the test should be set together with the examiner and the person in charge of maturity tests in the faculty (office of the School of Business).

The examiner gives the topic of the test. **The maturity test is evaluated on a scale of passed/failed.**

Assessment of the Master's thesis

The thesis must be reviewed by the examiners before it is printed.

The student submits the Master's thesis in its final form, i.e. bound in black covers to the examiners for assessment. Both examiners are given their own copy. The assessment application, abstracts in Finnish and English, the possible confidentiality notification of the commissioner, and a copy bound

in black covers are submitted to the faculty study coordinator no later than 14 days before the date on which the dean approves theses. Foreign students do not need to prepare an abstract in Finnish.

The examiners prepare a written statement on the thesis and propose a grade. The title and grade of the thesis are shown in the degree certificate.

The statement on the Master's thesis will be prepared in English for students in international Master's programmes and for international students.

The student's Master's thesis may be evaluated in the same month as the student obtains his or her Master's degree.

Further information and schedules available on the faculty web site: Opiskelu ->Nykyiset opiskelijat

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.

The faculty assesses and approves the thesis after the student has submitted an assessment application to the faculty.

Instructions and forms are available on the web site of the School of Business: Opiskelu -> Nykyiset opiskelijat -> Pro gradu –tutkielman arvosteleminen. The degree certificate application is available on the faculty web site: Opiskelu -> Nykyiset opiskelijat -> Maisterin tutkinnon anominen ja tutkintotodistus.

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 university Registrar's office.

3. Content of the Master's thesis and how to conduct research

Language of the Master's thesis

The 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. If the commissioner of the thesis requires the use of a language other than Finnish, the commissioner is responsible for the translation or language revision of the thesis. In degree or Master's programmes in English, the thesis is prepared in English and the author is responsible for revising the language.

Inventions related to the thesis

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). If the invention made in connection with the thesis is to be patented, the patent application must be left before the work is published. Otherwise, the thesis must be written so that the invention is not revealed.

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.

Content of the thesis

The thesis may be composed e.g. of the following items in the following order:

- Title page
- Abstract in Finnish
- Abstract in English
- Acknowledgements
- Table of contents
- List of symbols and abbreviations
- Introduction
- Discussion (theories, background and implementation of the research)
- Conclusions (analysis of observations and results)
- Summary (concise summary of the above)
- References
- Appendices

Title page

The title page includes the title of 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 (one A4 sheet), objective, independent summary of the Master's thesis. It should be intelligible as such, without the original document. It explains the contents of the thesis: the objective, methodologies, results and conclusions. 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.

Acknowledgements

Acknowledgements are a brief description of what or who had an impact on the thesis. E.g. the people who furthered the progress of the thesis may be thanked.

Table of contents

The table of contents lists the headings and sub-headings and their page numbers.

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 are 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.

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 briefly describes the background, material extent and aims of the thesis. The introduction relates the thesis to other research and sources and presents the research methodology applied. It also describes the key points and organisation of the research report. It does not, however, include detailed descriptions of the theory, methods or results. A good introduction is, nevertheless, significantly longer than a couple of pages, and is organised in a logical manner.

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. However, 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.

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 e.g. tables. 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. The author must also explain under which conditions the calculations, formulae and equations are applicable.

Conclusions

Depending on the nature and scope of the study, the report ends either with the chapter “Conclusions”, or two separate chapters, e.g. “Conclusions” and “Summary”. The conclusions analyse the observations and results drawn from the research. They also examine and reflect on e.g. the compatibility of the theory and measurements, the reasons for possible differences, and summarise the conclusions drawn from the results. The need for further research and possible practical applications may also be argued here.

Summary

The summary is a concise description of the entire work: it presents the starting point of the research, the theoretical and empirical choices, aims, results, conclusions and possible ideas for further research. No new information is introduced in the conclusions, and no direct references are made to the discussion. The importance of the summary should not be underestimated because often the reader only reads the summary or the introduction and the summary.

Carrying out the research

The thesis is to be prepared according to good scientific practice. The research methods must be approved by the scientific community. The prevailing approaches and research methods in the field in question are to be applied. The student should learn about the research methodology and practices in his/her field sufficiently before preparing the thesis.

Plagiarism is absolutely forbidden. Citations and references must be made in accordance with good practice. If the student plagiarises material in his/her assignment or thesis, the supervisor must address the issue without delay. The final version of the thesis may not include references and citations that go against good scientific practice.

If, regardless of the supervisor’s guidance, the final version contains plagiarised material, the failing grade *improbatur* will be proposed for the thesis. Moreover, the director of administration will be informed of the matter.

4. Layout of the Master’s thesis in business

The presentation of the thesis is very important in terms of readability, intelligibility and reliability. A finished layout gives a good and reliable impression of both the work and its author. The thesis is written in standard language and in the passive voice. Abbreviations, such as e.g. or etc. should not be used, but instead, written out in their entirety.

Cover, presentation and electronic version

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 and run-on sentences. 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 and spacing 1.5.
- 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.
- 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.

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.

The student submits an abstract of the thesis to the university’s electronic database LUTPub, which is maintained by the library. Also the entire thesis may be uploaded into the database, in which case it can be accessed by the general public in an open network.

Parts of the thesis

Title page

The title page includes the following information:

- University, Faculty, Major subject/Master’s programme
- Author of the Master’s thesis
- Title of the Master’s thesis
- Examiners of the thesis (first and second, the supervisor is mentioned first)
- Possible period of confidentiality (lower right-hand corner)

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, School of Business” is correct. The layout of the title page should be balanced, such as in assignment reports.

Abstracts in Finnish and English

You should favour the passive voice or the third 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 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. 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 complete identification information should be included at the beginning of both the Finnish and the English abstract in the following order:

Author’s name
 Title of thesis
 Faculty
 Major subject or Master’s programme
 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 of thesis:	Activity-based costing in a service enterprise
Faculty:	School of Business
Major subject/Master's programme:	Accounting/Master's Programme in Accounting
Year:	2011
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.

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 are available from the library and its web site.

Acknowledgements

The acknowledgements recognise the help, guidance, advice etc. provided by others and give thanks to them. Also the commissioner of the thesis is mentioned. The acknowledgements are concluded with the author's name and the date after which no more modifications have been made to the work.

Table of contents

The pages are numbered in Arabic numerals from where the text starts. Please note that the first page (number 1) of the thesis is the title page. Thus the table of contents may be e.g. on page 4. The table of contents lists the headings and sub-headings and their page numbers. 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). **Please note that no more than three levels of headings are allowed.** If there is need for more detailed sub-headings, they should not be numbered. 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. The page numbers are aligned to the right.

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.

TABLE OF CONTENTS

1 INTRODUCTION	6
1.1 Background	6
1.2 Research problem, objectives and delimitation	9
1.3 Research methodology	11
1.4 Organisation of the study	13
2 THEORETICAL STARTING POINTS OF THE STUDY	14
2.1 Starting point established by the transaction cost theory	14
2.2 Limitations of the transaction cost theory	16
2.3 Resources and competencies as the reason for competitive edge	18
- - - - -	
5 EMPIRICAL PART: MANAGEMENT OF COOPERATION IN THE ICT SECTOR	63
5.1 Description of material and variables	63
5.1.1 Data collection	68
5.1.2 Descriptive information on the material	71
5.2 Testing of hypotheses	78
5.3 Analysis of the results	87
6 CONCLUSIONS AND SUMMARY	93
REFERENCES	96
APPENDICES	
APPENDIX 1: Statistical results	
APPENDIX 2: Companies interviewed	

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, a definition of the research problem, objectives, point of view, delimitation and research methodology. Different parts can be presented as separate subsections.

Discussion

Each citation in the discussion 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 the 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.

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. The variables in the figures are presented in the same way as in the text and equations.

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

$$D_1 = \varepsilon E_1.$$

(4)

As in Equation (4) above, equations can be treated as elements of a sentence, which means punctuation, such as commas and periods, may also be used in connection with them.

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

Matrices can be treated as ordinary variables, in which case their symbols may be bolded, e.g. tension matrix \mathbf{U} . 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.

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). In the commonly used 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 starting from the oldest one. 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. Also unpublished reference material and important oral communications must be listed. The sources must be critically evaluated. The reference list must also indicate where rare and less known sources are available.

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)
number
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

For example.: 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. In: Hoikka, P. (ed.) Kunnat 2000-luvun kynnyksellä. 2nd revised ed. Tampere: University of Tampere.

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.

Electronic 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>

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 (e.g. two different authors cited in one paragraph), 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.

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/Master's programmes may issue their own instructions for authors to follow. Authors must also take into account the requirements set by the language of the thesis.

Footnotes

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.

- 1.1.
- 1.2.

Appendices

Appendices may include equations, diagrams, drawings, forms, etc. that do not need to be included in the actual text but to which the text refers. 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 appendices should not, however, contain anything irrelevant to the thesis.

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. 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.

REFERENCES

ISO 690-2:1997 Information and documentation—Bibliographic references—Part 2: Electronic documents or parts thereof

Mälkiä, M. 1994. Teksti ja kirjallisuusviitteiden laatiminen. 2nd unrevised ed. Tampere: Tampereen yliopisto. Hallintotiede B 6.

SFS 5342 Kirjallisuusviitteiden laatiminen. 2nd ed. Helsinki: Suomen standardisoimisliitto. 1992.

SFS 5831 Viittaaminen sähköisiin dokumentteihin tai niiden osiin. Helsinki: Suomen standardisoimisliitto. 1998.

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.