STUDY GUIDE 2007-2008

STUDY PROGRAMMES AND COURSES IN ENGLISH

University of Technology and Economics

Lappeenranta University of Technology is a university specialised in technology and economics. Education in technology began in 1969, and business administration education was launched in 1991. Over 5000 students study on the Skinnarila campus today. By the end of 2005, the university has produced 5500 Masters of Science in Technology, 900 Masters of Science in Economics and Business Administration, 188 licentiates and 227 doctors.

Expertise in technology and business are combined in a unique way in training and research at Lappeenranta University of Technology (LUT). The university's areas of emphasis involve the forest and metal cluster, energy and information and communication technology. Expertise in Russian business and industry and the promotion of entrepreneurship play an important role in all of the university's fields of specialisation.

Values that impact the activity of Lappeenranta University of Technology are ethics, high quality and the "Skinnarila spirit". The Skinnarila spirit embodies industriousness, innovation, commitment, cooperation, encouragement, openness and the cheerful and friendly Karelian way of life. In keeping with this spirit, the university trains international specialists with a strong ethical foundation and the ability to continuously learn and develop themselves.

THE UNIVERSITY'S ACADEMIC YEAR 1 August 2007 – 31 July 2008

The periods and exam and intensive course weeks for the academic year 2007-2008:

AUTUMN SEMESTER 2007

Periods

1st	3 Sep. – 19 Oct. 2007
2nd	29 Oct. – 14 Dec. 2007

Intensive Week

Week 43	22 – 26 Oct. 2007

Exam Weeks

Week 35	27 – 31 Aug. 2007
Week 43	22 – 26 Oct. 2007
Week 51	17 – 21 Dec. 2007

SPRING SEMESTER 2008

Periods

3rd	14 Jan. – 29 Feb. 2008
4th	10 Mar. – 2 May 2008

Intensive Weeks

Week 2	7 – 11 Jan. 2008
Week 10	3 – 7 Mar. 2008
Week 19	5 – 9 May 2008

Exam Weeks

Week 2	7 – 11 Jan. 2008
Week 10	3 – 7 Mar. 2008
Weeks 12-13	20 and 25-26 Mar. 2008
Week 19	5 – 9 May 2008
Week 20	12 – 16 May 2008

Examinations are organised during the periods on Mondays and Wednesdays at 16.15 (five-hour exams start at 15.15) and on Fridays at 14.15. On exam weeks examinations are organised Monday-Friday at 9.15 and 16.15 (five-hour exams start at 15.15). No exams are arranged on 7 December 2007, 30 April 2008 or 2 May 2008. On the **Easter exam week** 20 March and 25-26 March 2008, examinations are organised Monday-Friday at 9.15 and 16.15 (five-hour exams start at 15.15). **No lectures** are given during this time.

Saturday exams may be organised on 27 Oct. 2007 and 8 Mar. 2008; the degree programmes and faculties will decide on the arrangements at a later date.

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

Orientation for new students is organised 27–31 August 2007.

1 Studying at Lappeenranta University of Technology

Study Entitlement and Registration for the Academic Year

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

Registration for the academic year 2007-2008 starts 1 June 2007 and ends 27 August 2007. **The student union membership fee must be paid by all 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 (27 August) 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 complete both the Bachelor's degree (180 ECTS cr) and the Master's degree (120 ECTS cr) must carry out their studies in 7 years. Those who complete only the Master's degree (120 ECTS cr) have 4 years to do so. The time limit does not apply to students completing the so-called old Master's degree worth 180 credit units.

Further information on registration for the academic year and the limit of the study right is available from the Student Affairs Office and the university web site.

Study Guidance

Orientation for new students will be organised at the beginning of the academic year. The students will learn more about the university, departments and studies, and they will be helped with practical arrangements related to starting studies at LUT. There will also be briefings regarding important issues later on during the studies. Students will be informed of them separately.

You can find answers to many general questions on studies from this guide and the university web site. Individual study guidance is offered by the degree programmes' study coordinators, student advisers, heads of study affairs at the faculties, tutors and teachers. Furthermore, the university psychologist, the staff of the Student Affairs Office and the entire university is there to help students with issues related to their tasks.

Each faculty has a **head of study affairs** who manages the faculty's study affairs. Their tasks differ a bit in each faculty. They can, however, tell you who to turn to with different questions.
Study coordinators are experts in studies provided by their degree programme. **They offer study guidance from the very beginning of the studies until graduation. They help with e.g. the individual study plan (credit transfer from previous studies and other universities, substituting courses, etc.) and with students' applications and other administrative issues.**
The faculties and degree programmes also have **study affairs secretaries** who attend to study affairs.

Student tutors assist new students with practical arrangements at the beginning of their studies. During orientation, freshmen are divided into small groups led by older students or tutors. The tutors help new students start their studies. *Teachers and assistants are naturally the best sources of information in their own field and courses, and instruct students with matters related to them.* ***Students can consult them during their office hours.***

Study coordinators of international students:

• Faculty of Technology	Ms Minna Loikkanen	05 621 2444
• Faculty of Technology Management	Ms Riitta Salminen	05 621 2659
• School of Business	Ms Minna Ranta	05 621 7214
• International Business and Technology Management	Ms Virpi Maunuksela	05 621 6083

The services of the **university psychologist** will be available from the beginning of the 2007 autumn semester. You can turn to the psychologist e.g. if you have lost your motivation or no longer know why you are studying in the first place or what your goal is. You can talk to the psychologist about different learning styles and techniques, or talk confidentially about other issues that have an impact on your studies.

WebOodi

WebOodi is the user interface for LUT students through which they register for exams, courses 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 its instructions can be accessed at www.lut.fi. 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.

If your contact information changes, you should make sure that the Student Affairs Office gets the new information and that it is updated in the student register. You can update the information (e.g. address, municipality of residence, 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 courses before they begin. 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.

You can register for courses through WebOodi.

Registration for courses in the academic year 2007-2008 starts 1 August 2007 and ends as follows for each period:

Registration for courses in Period 1 ends	2 Sep. 2007 at 23.59
Registration for courses in Period 2 ends	28 Oct. 2007 at 23.59
Registration for courses in Period 3 ends	13 Jan. 2008 at 23.59
Registration for courses in Period 4 ends	9 Mar. 2008 at 23.59

In the autumn semester, lectures start on 3 September 2007, and in the spring semester on 14 January 2008.

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

Remember to register for courses and exams separately.

Registration for Examinations

The dates and times of examinations are given in the exam schedule on the university web site, and registration is in WebOodi.

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

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

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

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

Evaluation of Completed Courses

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

Language skills in the other official language of Finland (Finnish or Swedish, whichever is not the student's native language) are graded good (H) or satisfactory (T). Oral and written communication skills are evaluated separately.

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 grade. If the student is not satisfied with the teacher's reply to the correction request, he or she may take the matter up with the university's degree committee. The correction request must be submitted to the Student Affairs Office within 14 days of receiving the teacher's reply. The decision of the degree committee is final, no appeal can be made.

Regulations on Studies

The provisions laid down in the Universities Act and the decree on universities apply to LUT.

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

Disciplinary Measures

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

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

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

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

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

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

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

Degree Certificates

Students receive separate degree certificates for the Bachelor's degree (180 cr) and Master's degree (120 cr).

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

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 thesis.

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

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

Students will receive a special mention in their Master's degree (120 ECTS cr) certificate of having carried out their studies *with distinction* if their overall grade is at least 4 and the grade for their Master's thesis is 4 or 5. In 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.

International degree students will receive their Master's degree certificate both in English and in Finnish.

As an appendix to the degree certificate, students will receive a transcript of records in Finnish and English, a Diploma Supplement in English, and on request a separate transcript of courses completed outside Lappeenranta University of Technology.

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

2 Student Support Services

Student Affairs Office

The Student Affairs Office is located on the 1st floor of the university's main building. It provides general guidance and services for students in e.g. the following matters:

- registration for the academic year
- registration for courses and exams
- WebOodi
- registration certificates
- study guides
- records of completed courses
- official transcripts of records
- the exam schedule
- degree certificates

You may visit the 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 reach the office staff by telephone.

The Student Affairs Office phone numbers are 05 621 6061, 05 621 6062 and 05 621 6063, and you can send e-mail to 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.

You can also ask for a registration certificate if you need to prove you are a registered student at the university. The registration certificate is available in Finnish or English. There are different registration certificates for different purposes, so please mention why you need it.

International and Career Services

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

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

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

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

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

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

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

Origo and the Learning Centre

Origo provides LUT students and staff a working and study environment with information services. The facilities have state-of-the-art equipment and programmes for online studies, information retrieval and processing, and independent studies and electronic student services. Student can also take their maturity test and a number of other exams on a computer in the exam aquarium. Origo houses both the LUT library and the Learning Centre.

LUT's Learning Centre supports the university's students and teachers in the development of teaching and learning. The Learning Centre's services include a university psychologist, online instruction and study support, and feedback system and exam aquarium support. The development of studying and teaching is also supported through different projects. These projects promote the development of e.g. study guidance, tutoring, the evaluation of teaching and learning, and virtual teaching. The Learning Centre also coordinates LUT's peer tutoring and offers related training in cooperation with the faculties.

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 loan course books or search for information for their assignments or theses. Books are loaned 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 loaned from other libraries through LUT's loaning service.

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

3 Degrees in Technology

General Information

At Lappeenranta University of Technology, the lower university degree in technology is Bachelor of Science (Technology), 180 ECTS credits, and the higher university degree is Master of Science (Technology), 120 ECTS credits. Students first complete the Bachelor's degree studies, which are followed by the Master's degree studies.

Students are admitted into degree programmes, which lead to these degrees. A degree programme is an entity of courses with scholarly and professional aims. Students specialise in a professional field of technology and its development. The degree programmes at LUT are:

- the Degree Programme in Energy Technology
- the Degree Programme in Chemical Technology
- the Degree Programme in Mechanical Engineering
- the Degree Programme in Electrical Engineering
- the Degree Programme in Information Technology
- the Degree Programme in Industrial Engineering and Management
- the Degree Programme in Environmental Technology

The Master's degree programmes in English are:

- Master's Degree Programme in Bioenergy Technology
- Master's Degree Programme in Chemical and Process Engineering
- Master's Degree Programme in Electrical Engineering
- Master's Degree Programme in Information Technology
- Master's Degree Programme in Mechanical Engineering
- Master's Degree Programme in New Packaging Solutions
- CBU Master's Degree Programme in Information and Communications Technology

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 compulsory, optional or elective.

Major Subjects
The degree programmes are divided into major subjects. In the Bachelor's degree, the major studies contain basic and intermediate studies. In the Master's degree, the major studies are advanced studies.

Students must apply for a major subject, and the head of the degree programme decides on admissions. The application period and admissions are usually in the spring semester. Further information will be provided by the degree programmes.

Minor Subjects
Minor studies in the Bachelor of Science (Technology) degree are at least 20 ECTS credits, with the exception of Industrial Engineering and Management where the minor studies in technology are 30 ECTS credits. A minor subject in the degree of Master of Science (Technology) is at least 20 ECTS credits.

Some minor subjects started in the Bachelor's degree studies may be continued in the Master's degree. The minor studies in the Bachelor's and Master's degrees both worth 20 ECTS credits will

then compose an extensive minor subject (a minimum of 20+20 ECTS credits, or for the technology minor in Industrial Engineering and Management, 30+20 ECTS credits).

There may be restrictions in selecting a minor subject in certain programmes. Further details on these restrictions are provided in the section of each degree programme.

Minor subjects for degree programmes in technology are listed in this guide in the section of each degree programme. Other minor subjects are listed at the end of the guide under “Other Minor Subjects for Technology Students”.

Individual Study Plan (HOPS and eHOPS)
The individual study plan allows students to plan their studies. The plan contains the courses included in the student's degree.

The study plan is made for the entire duration of the studies, i.e. until the higher university degree is completed. The faculties will give further information on how to prepare and update the individual study plan. Further details are available on the degree programme web sites and from study counsellors and coordinators.

From autumn 2007, LUT will be piloting the WebOodi eHOPS tool in some degree programmes. The adoption of eHOPS is at different stages in the degree programmes; further information will be provided by your student advisor.

Credit Transfer
Credits from studies in other Finnish or foreign universities or institutes can be transferred into LUT degrees. In such cases, students must submit an application to the degree programme. The Language Centre decides on credit transfer for compulsory language studies.

However, the Bachelor of Science (Technology) degree must include at least 90 ECTS credits completed at LUT (80 ECTS credits and a Bachelor’s thesis and seminar 10 ECTS credits).

A Master’s degree (120 ECTS credits) must contain at least 70 ECTS credits completed at LUT (Master’s thesis 30 ECTS credits and other studies 40 ECTS credits, of which at least 15 must be major studies). A maximum of 30 ECTS credits can be transferred to the M.Sc. degree from a higher university degree in another Finnish university.

Transferred courses will be entered into the student's records and given the grade 'passed' (H).

More information on credit transfer is given by the study guidance staff.

Internship
The degree of Bachelor of Science (Technology) can include an internship worth 2 ECTS credits. During the internship students learn about their professional field, the workplace and its relationships, conventions, problems and solutions.

The degree of Master of Science (Technology) includes a compulsory internship (at least 2 ECTS credits). Students may receive a maximum of 10 ECTS credits for their internship in the Master’s degree. The internship aims at furthering the student’s professional skills and teaching the student to apply theoretical knowledge to practical issues. Further information on the extent of the compulsory internship in Master’s degree programmes in English – if any required – is given in the section of degree structures of each study programme.

Two weeks of full-time work corresponds to one credit. If the employment relationship is less than 15 working days, it will not be approved as an internship.

The internship is assessed and approved by a person appointed by the head of the degree programme.

Employment prior to the studies may be accepted by the appointed coordinator as an internship if it has not been included in any previous degrees.

Further information on internships is provided by the head of the degree programme. Details are also available from your study guidance staff and the university web site.

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

The maturity test for the Bachelor's degree is supervised and students are not allowed to use reference material. The maturity test is evaluated by the supervisor of the thesis with regard to the content, and a language specialist appointed by the university with regard to the language.

Students must take a written maturity test to demonstrate their language skills and how well they know the topic of their thesis. If the student has demonstrated his or her Finnish or Swedish skills in connection with the Bachelor's degree or another previous university degree, only the content of the maturity test will be evaluated, and the head of the degree programme may allow the student to substitute his/her presentation in the Master's degree seminar for the maturity test. Degree programmes may also have other ways of substituting the maturity test.

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

The maturity test is evaluated pass/fail.

Further instructions on the maturity test are available in the Language Centre study guide and on the university web site.

Bachelor of Science (Technology)

The workload of the degree of Bachelor of Science (Technology) is 180 ECTS cr. The degree usually takes three years of full-time studies to complete. It is composed of the following studies:

- general studies, at least 100 ECTS cr or in Industrial Engineering and Management at least 90 ECTS cr
- major subject and supporting studies 40-50 ECTS cr
- minor subject, at least 20 ECTS cr or in Industrial Engineering and Management at least 30 ECTS cr
- elective studies 10-20 ECTS cr

Language and communication studies and the internship are included in general studies. The Bachelor's thesis and the related seminar are included in the major studies.

Bachelor's Thesis
At the end of their lower university studies students prepare a Bachelor's thesis. The Bachelor's thesis is an independent course or an assignment connected with a course in the student's major studies (which is not included in the course in question). The workload of the thesis and the related seminar is 10 ECTS cr.

The thesis is supervised and examined by the instructor of the course in question or someone else assigned by the degree programme. The thesis is evaluated on the scale excellent (5), very good (4), good (3), satisfactory (2), sufficient (1) and failed (0).

Students from all faculties prepare their Bachelor's thesis according to the instructions given by the vice-rector in charge of teaching. The instructions are available at the end of this guide and on the university web site. Faculties may give their own instructions for the Bachelor's thesis.

Master of Science (Technology)

The workload of the degree of Master of Science (Technology) is 120 ECTS cr. The degree usually takes two years of full-time studies to complete. It is composed of the following studies:

- general studies, at least 20 ECTS cr
- major subject and supporting studies at least 60-70 ECTS cr
- minor subject, at least 20 ECTS cr
- elective studies at least 10-20 ECTS cr

Language and communication studies and the internship are included in general studies. The major studies include a Master's thesis, which is worth 30 ECTS cr.

Complementary Studies for Students Admitted Directly into a Master's Programme
If a student has been admitted into the university only to complete the Master's degree (120 ECTS cr), the degree programme in question may require complementary studies depending on the student's previous studies. The student may need to carry out up to 60 ECTS credits of complementary studies. They are not included in the Master's degree, but are an addition to it.

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

The topic of the Master's thesis is approved by the head of the degree programme, who will also appoint a supervisor from among the university's professors or adjunct professors. The head of the degree programme will appoint two examiners, the first of which is always the supervisor.

The Bachelor's degree and possible complementary studies must be completed before applying for the approval of the thesis topic. Other conditions are specified in the instructions for preparing a Master's thesis issued by the vice-rector.

The Master's thesis can also be a group project of two or more students. However, in such cases one should be able to distinguish the parts of the thesis prepared independently by each student. These parts should be evaluated separately. The thesis can be prepared in Finnish, Swedish or English. Permission for using other languages is granted by the head of the degree programme. In Master's programmes taught in English, the Master's thesis is also prepared in English.

The faculty council will assess the thesis. The thesis is evaluated on the scale excellent (5), very good (4), good (3), satisfactory (2), sufficient (1) and failed (0).

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

Postgraduate Degrees

After the Master's degree, LUT offers extensive possibilities for completing the postgraduate degrees of Licentiate of Science (Technology), Doctor of Science (Technology) 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 supporting 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 also available from the faculty study guidance staff and the university web site.

4 Master's Degree Programme in Information Technology

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

The Aims of the Master's Degree Programme

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

Professional Scope of the Master's Degree Programme

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

Fields of Specialisation

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

1. **Information Processing**
2. **Communications Engineering**

1. **Students of Information Processing** get a broad idea of the applications and methods of information processing as well as information processing systems and their design. Advanced studies focus on intelligent information processing and its applications. The graduates can work in:

   - Research and development of information processing systems and software
   - Project planning and management
   - Research and teaching in universities

2. **Students of Communications Engineering** gain knowledge and will become experts in the following areas:

   - Design, development and maintenance of communications systems
   - Development of communications software and hardware products

   Students will get specialized in designing and implementing communications software. They will gain in-depth view of network architectures including wired, wireless and optical networks. Students will learn how to develop secure services to wireless terminals. In courses related to Parallel and Distributed Computing students will learn the basic concepts of parallel computing and different ways to harness the power of various parallel computer platforms. Students gain knowledge on parallel algorithms and deepen it on more advanced courses. Existing

programming skills will be enhanced to utilize parallel methods in distributed and shared memory machines by implementing algorithms on our laboratory's parallel computing environment. Various changing themes relating to parallel computing and data communications are discussed in seminar courses.

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

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

Communications Engineering
Students with major in Communications Engineering are expected to master engineering mathematics, especially statistics, discrete mathematics, and trigonometric series. From physics the areas covered are both electronics and wave motion. A student is expected to have basic knowledge in wired and wireless communication systems and in protocols in communications.

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

Complementary Studies
Students with a Finnish Polytechnic degree will have to study complementary studies.

The Degree Structure

Master of Science 120 ECTS cr

	ECTS cr
General studies	25/14
Major subject	65
Minor subject	20
Elective studies	10/21
Total	*120*

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.

MAJOR: Information Processing

General studies (25 ECTS cr)

Obligatory		*year*	*per.*	*ECTS cr*
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
CT20A2500	Object-Oriented Programming Techniques	M.Sc. (Tech.) 1	1-2	5
CT20A3000	Unix and System Programming	M.Sc. (Tech.) 1	2-3	5
CT20A3100	Introduction to Machine Vision and Machine Learning	M.Sc. (Tech.) 1	3-4	6
FV11A9000	Academic Seminar for International Programs		2–4	6
FV10A 2EC	Language and Communication Studies			2

') The course Teknisk svenska is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree. The course Finnish for Foreigners is obligatory for foreign students.

Major subject 65 ECTS cr

Obligatory (52 ECTS cr)		*year*	*per.*	*ECTS cr*
CT10A9500	Research Methods	M.Sc. (Tech.) 1	1	3
CT20A6000	Pattern Recognition	M.Sc. (Tech.) 1	3-4	7
CT20A6100(1	Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 2	1-2	7
CT20A6200(1	Computer and Robot Vision	M.Sc. (Tech.) 1	1-2	7
CT20A6400	Languages, Compilers and Interpreters	M.Sc. (Tech.) 1	3-4	5
Thesis	Master's Thesis			30

1) Exchangeable

Elective courses (min. 13 ECTS cr should be selected)		*year*	*per.*	*ECTS cr*
CT10A9600	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	2-4	5
CT20A6100	Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 1	1-2	7
CT20A6200	Computer and Robot Vision	M.Sc. (Tech.) 1	1-2	7
CT20A6300	Evolutionary Algorithms	M.Sc. (Tech.) 1	1-2	5
CT20A7000	Information Systems Research	M.Sc. (Tech.) 1	1-2	7
CT20A7200	Architecture in Systems and Software Development	M.Sc. (Tech.) 1	3-4	5
CT20A7300	Software Quality, Processes, and Organizations	M.Sc. (Tech.) 2	1-2	5
CT30A7000	Parallel Computing	M.Sc. (Tech.) 1	1-2	6
CT30A7100	Parallel Programming	M.Sc. (Tech.) 1	3-4	5

Minor Subject 20 ECTS cr

One of the minors should be selected

Communications Engineering, minor subject

Obligatory (10 ECTS cr)		*per.*	*ECTS cr*
CT30A5000	Network Programming	2-3	5
CT30A5800	Communications Software and Architecture	1-2	5

Elective (10 ECTS cr)		*per.*	*ECTS cr*
CT10A9600	Research Methods, Laboratory Project	2-4	5
CT30A2700	Network Design and Traffic Engineering	3-4	5
CT30A5900	Communication Software Laboratory Work	3-4	5
CT30A6500	Performance Analysis of Telecommunication Systems	1-2	5
CT30A7000	Parallel Computing	1-2	6
CT30A7100	Parallel Programming	3-4	5

CT30A7400	Distributed Object Programming	1-2	6
CT30A8800	Secured Communications	1-2	6
CT10A9700	Summer School on Communications Engineering	int.	2

Elective (minimum total must be 20 ECTS cr)

International Marketing		*per.*	*ECTS cr*
AC40A0100	Cross-Cultural Marketing Strategies	2	5
AC40A0150	Integrated Marketing Communication	4	5
AC40A0200	Internationalization of the Firm	2	5
AC40A0250	Sales Management and Personal Selling	3-4	5

Finance		*per.*	*ECTS cr*
AB30A0200	Asset Pricing Theory and Portfolio Management	2	7
AB30A0300	International Finance and Emerging Markets	2	5
AB30A0500	Financial Econometrics	1	5
AB30A0550	International Financial Management	3	6

Strategy Research		*per.*	*ECTS cr*
AB40A0500	Innovation and Competitiveness	3	5

Management and Organization		*per.*	*ECTS cr*
AC30A0450	Management Consulting	January 2008	6

Knowledge Management		*per.*	*ECTS cr*
AC50A0050	Introduction to Knowledge Management, book exam	1-4	4
AC50A0300	Organizational Learning and Competence Management	4	6
AC50A0500	Activity Theoretical Approach to Knowledge Creation and Innovation	2	4

Elective studies 10 ECTS cr

MAJOR: Communications Engineering

General studies (14 ECTS cr)

Obligatory		*year*	*per.*	*ECTS cr*
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
CT30A5000	Network Programming	M.Sc. (Tech.) 1	2-3	5
FV11A9000	Academic Seminar for International Programs	M.Sc. (Tech.) 1	2–4	6
FV10A 2EC	Language and Communication Studies			2

') The course Teknisk svenska is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree. The course Finnish for Foreigners is obligatory for foreign students.

Major subject 65 ECTS cr

Obligatory (48 ECTS cr)		*year*	*per.*	*ECTS cr*
CT10A9500	Research Methods	M.Sc. (Tech.) 1	1	3
CT30A2700	Network Design and Traffic Engineering	M.Sc. (Tech.) 1	3-4	5
CT30A5800	Communications Software and Architecture	M.Sc. (Tech.) 1	1-2	5
CT30A5900	Communication Software Laboratory Work	M.Sc. (Tech.) 1	3-4	5
Thesis	Master's Thesis			30

Elective courses (min. 17 ECTS cr should be selected)		*year*	*per.*	*ECTS cr*
CT10A9600	Research Methods, Laboratory Project	M.Sc. (Tech.) 1	2-4	5
CT20A6100	Machine Vision and Digital Image Analysis	M.Sc. (Tech.) 1	1-2	7
CT20A6200	Computer and Robot Vision	M.Sc. (Tech.) 1	1-2	7
CT20A6300	Evolutionary Algorithms	M.Sc. (Tech.) 1	1-2	5
CT20A7000	Information Systems Research	M.Sc. (Tech.) 1	1-2	7
CT30A6700	Group Work Course on Communications Software	M.Sc. (Tech.) 1	1-4	8
CT30A7000	Parallel Computing	M.Sc. (Tech.) 1	1-2	6
CT30A7100	Parallel Programming	M.Sc. (Tech.) 1	3-4	5
CT30A7200	Design of Parallel Algorithms	M.Sc. (Tech.) 1-2	3-4	5
CT30A7300	Advanced Parallel Computing	M.Sc. (Tech.) 1-2	3-4	5
CT30A7400	Distributed Object Programming	M.Sc. (Tech.) 1	1-2	6
CT30A8300	Wireless Service Engineering	M.Sc. (Tech.) 2	1-2	5
CT30A8800	Secured Communications	M.Sc. (Tech.) 1-2	1-2	6
CT10A9700	Summer School on Communications Engineering	M.Sc. (Tech.) 2	int.	2

Minor Subject 20 ECTS cr

One of the minors should be selected

Information Processing, minor subject

Obligatory (11 ECTS cr)		*per.*	*ECTS cr*
CT20A3100	Introduction to Machine Vision and Machine Learning	3-4	6
CT20A6400	Languages, Compilers and Interpreters	3-4	5

Elective (9 ECTS cr)		*per.*	*ECTS cr*
CT20A2500	Object-Oriented Programming Techniques	1-2	5
CT20A6000	Pattern Recognition	3-4	7
CT20A6100	Machine Vision and Digital Image Analysis	1-2	7
CT20A6200	Computer and Robot Vision	1-2	7
CT20A6300	Evolutionary Algorithms	1-2	5

Elective (minimum total must be 20 ECTS cr)

International Marketing		*per.*	*ECTS cr*
AC40A0100	Cross-Cultural Marketing Strategies	2	5
AC40A0150	Integrated Marketing Communication	4	5
AC40A0200	Internationalization of the Firm	2	5
AC40A0250	Sales Management and Personal Selling	3-4	5

Finance		*per.*	*ECTS cr*
AB30A0200	Asset Pricing Theory and Portfolio Management	2	7
AB30A0300	International Finance and Emerging Markets	2	5
AB30A0500	Financial Econometrics	1	5
AB30A0550	International Financial Management	3	6

Strategy Research		*per.*	*ECTS cr*
AB40A0500	Innovation and Competitiveness	3	5

Management and Organization		*per.*	*ECTS cr*
AC30A0450	Management Consulting	January 2008	6

Knowledge Management		*per.*	*ECTS cr*
AC50A0050	Introduction to Knowledge Management, book exam	1-4	4
AC50A0300	Organizational Learning and Competence Management	4	6
AC50A0500	Activity Theoretical Approach to Knowledge Creation and Innovation	2	4

Elective studies 21 ECTS cr

The Courses Offered in English

		ECTS cr
CT10A9500	Research Methods	3
CT10A9600	Research Methods, Laboratory Project	5
CT10A9700	Summer School on Communications Engineering	2
CT20A2500	Object-Oriented Programming Techniques	5
CT20A3000	Unix and System Programming	5
CT20A3100	Introduction to Machine Vision and Machine Learning	6
CT20A6000	Pattern Recognition	7
CT20A6100	Machine Vision and Digital Image Analysis	7
CT20A6200	Computer and Robot Vision	7
CT20A6300	Evolutionary Algorithms	5
CT20A6400	Languages, Compilers and Interpreters	5
CT20A7000	Information Systems Research	7
CT20A7200	Architecture in Systems and Software Development	5
CT20A7300	Software Quality, Processes, and Organizations	5
CT30A2700	Network Design and Traffic Engineering	5
CT30A5000	Network Programming	5
CT30A5800	Communications Software and Architecture	5
CT30A5900	Communication Software Laboratory Work	5
CT30A6200	Mobility Management	4
CT30A6500	Performance Analysis of Telecommunication Systems	5
CT30A6700	Group Work Course on Communications Software	8
CT30A7000	Parallel Computing	6
CT30A7100	Parallel Programming	5
CT30A7200	Design of Parallel Algorithms	5
CT30A7300	Advanced Parallel Computing	5
CT30A7400	Distributed Object Programming	6
CT30A8300	Wireless Service Engineering	5
CT30A8800	Secured Communications	6

Course Descriptions

CT10A9500	***RESEARCH METHODS*** ***3 ECTS cr***
	Research Methods, Tutkimusmenetelmät
Year and Period	M.Sc. (Tech.) 1, Period 1
Lecturer(s)	Lecturer, D.Sc. (Tech.) Arto Kaarna
Aims	To familiarize the student with the research work and the basic methods in research. To prepare the student to the research approach of her/his master's thesis.
Contents	Research work, philosophy of research. Research process. Designing research, research questions and hypothesis. Qualitative and quantitative research methods. Reporting scientific work.
Teaching Methods	Lectures 14 h, practical assignment, 1st period. Exam.
Assessment	0 - 5. Exam 50 %, practical assignment 50 %.
Course Material	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. Research reports.
Prerequisites	B.Sc. studies finished.

CT10A9600	*RESEARCH METHODS, LABORATORY PROJECT* *5 ECTS cr*
	Research Methods, Laboratory Project, Tutkimusmenetelmät, laboratorioprojekti
Year and Period	M.Sc. (Tech.) 1, Period 2-4
Lecturer(s)	Professor, D.Sc. (Tech.) Heikki Kälviäinen, Professor, D.Sc. (Tech.) Jari Porras
Aims	To execute a well-defined research task in the laboratory of Information Processing or Communications Engineering.
Contents	Research work in the topic defined by the laboratory. When starting the course contact one of the professors. Reporting and a seminar presentation of the work implemented.
Teaching Methods	Participation in the work of the research group, 2nd - 4th period.
Assessment	Passed/failed. Research report and seminar presentation.
Course Material	Literature related to the research topic, agreed with the supervisor of the work.
Prerequisites	CT10A9500 Research Methods finished, excellent grades in studies, evidence of successful research work.

CT10A9700	*SUMMER SCHOOL ON COMMUNICATIONS ENGINEERING* *2 ECTS cr*
	Summer School on Communications Engineering, Tietoliikennetekniikan kesäkoulu
Year and Period	M.Sc. (Tech.) 2, Period int.
Lecturer(s)	Lecturer(s) responsible: Professor, D.Sc. (Tech.) Jari Porras
Aims	Student actively participates all three days of summer school event. Student learns the basics and the current status of the selected topic of the summer school. Student gains practical experience by participating code camp.
Contents	Content changes every year. Basics, current status and research activities. Practical working on a code camp. Lectures will be held by visiting lecturers and researchers.
Teaching Methods	Lectures 16 h, practical assignment 20 h, written report about event.
Assessment	Passed/failed.
Course Material	http://www.it.lut.fi/ssotc/
Prerequisites	Basic programming skills. Recommended CT10A9500 Research Methods.

CT20A2500	*OBJECT-ORIENTED PROGRAMMING TECHNIQUES* *5 ECTS cr*
	Object-Oriented Programming Techniques, Olio-ohjelmoinnin menetelmät
Year and Period	B.Sc. (Tech.) 3, Period 1-2
Lecturer(s)	Professor, Ph.D. Kari Smolander
Aims	The student understands advanced concepts and techniques of object-oriented programming and can apply these techniques in solving practical programming tasks.
Contents	Java run-time object model. Reusability. Collections and containers. Polymorphic algorithms. Reflection. Serialization. Data and transaction management. Basics of distributed objects and component programming. Design patterns.
Teaching Methods	Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, exercises 14 h, practical assignment, 2nd period. Exam.
Assessment	0 - 5. Exam 50 %, exercises and practical assignment 50 %.
Course Material	Lecture notes. Eckel, B.: Thinking in Java, Prentice Hall. Gamma, E. et al.: Design Patterns, Addison-Wesley.
Prerequisites	CT20A2400 Olio-ohjelmoinnin perusteet.

CT20A3000	*UNIX AND SYSTEM PROGRAMMING* *5 ECTS cr*
	Unix and System Programming, Unix ja systeemiohjelmointi
Year and Period	B.Sc. (Tech.) 3, Period 2-3
Lecturer(s)	Researcher/Teacher, Docent, D.Sc. (Tech.) Joni Kämäräinen
Aims	To familiarize the student with advanced methods of Unix employment, based mainly on C and shell programming.
Contents	Shells, commands and scripts. Filters and interpreted languages. System calls and library functions for I/0 operations. Threads, processes and basic interprocess communication. Streams, sockets, network fundamentals.
Teaching Methods	Lectures 28 h, exercises 28 h, homeworks, 2nd period. Terminal project, 3rd period. Exam.
Assessment	0 - 5. Exam 100 %. Homeworks and project.
Course Material	Kernighan, B.W., Pike, R.: The UNIX Programming Environment, Prentice Hall, 1984. Stevens, W.R.: Advanced Programming in the UNIX Environment, Addison Wesley, 1997. Robbins, K.A., Robbins, S.: Practical UNIX Programming, Prentice Hall, 1996. Glass, G., Ables, K.: UNIX for Programmers and Users, Prentice Hall, 1999.
Prerequisites	CT20A0210 Käytännön ohjelmointi, CT20A2600 Käyttöjärjestelmät.

CT20A3100	*INTRODUCTION TO MACHINE VISION AND MACHINE LEARNING* *6 ECTS cr*
	Introduction to Machine Vision and Machine Learning, Johdanto konenäköön ja koneoppimiseen
Year and Period	B.Sc. (Tech.) 3, Period 3-4
Lecturer(s)	Researcher/Teacher, Docent, D.Sc. (Tech.) Joni Kämäräinen
Aims	Students should know the application areas, restrictions, and structure of machine vision systems. Students should be able to operate on digital images: capture images and extract basic visual information from them. Students should know the basics of machine learning and approaches to decision making using computer.
Contents	Applications of machine vision. Parts of machine vision system and their properties. Basics of digital imaging and image processing. Applications of machine learning. Describing intelligence and decision making in a computer. Approaches: statistical, rule-based, decision trees, neural networks, continuous-value problems, clustering, decision-support systems. Expert systems.
Teaching Methods	Lectures 21 h, exercises 14 h, homeworks, 3rd period. Lectures 21 h, exercises 14 h, homeworks, 4th period. Exam.
Assessment	0 - 5. Exam 100 %. Homeworks.
Course Material	Davies, E.R.: Machine Vision, 3rd Edition, Elsevier, 2005. Mitchell, T.M.: Machine Learning, McGraw-Hill, 1997.
Prerequisites	Matematiikka A and B, CT20A0200 Ohjelmoinnin perusteet.

CT20A6000	*PATTERN RECOGNITION* *7 ECTS cr*
	Pattern Recognition, Hahmontunnistus
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Senior Assistant, Docent, D.Sc. (Tech.) Ville Kyrki
Aims	The course has three basic aims: firstly to understand the field of pattern recognition in general, secondly to get familiar with pattern recognition techniques, and thirdly to obtain the ability to apply techniques to applications.
Contents	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.
Teaching Methods	Lectures 21 h, exercises 14 h, 3rd period.
	Lectures 21 h, exercises 14 h, 4th period. Practical assignment. Exam.
Assessment	0 - 5. Exam 50 %, exercises 50 %. Practical assignment.
Course Material	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, CT20A0210 Käytännön ohjelmointi, BM20A1400 Tilastomatematiikka I.
	Recommended CT20A3100 Introduction to Machine Vision and Machine Learning, BM20A1500 Numeerinen analyysi I, BM20A1600 Matriisilaskenta.

CT20A6100	***MACHINE VISION AND DIGITAL IMAGE ANALYSIS***	***7 ECTS cr***
	Machine Vision and Digital Image Analysis, Digitaalinen kuvankäsittely ja analyysi	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Heikki Kälviäinen	
Aims	To introduce students to the field of machine vision and image analysis and its application areas.	
Contents	Digital image processing: digital image, image transforms, image enhancement, image compression. Image analysis: segmentation, representation and description, recognition and interpretation. Hardware, software and applications.	
Teaching Methods	Lectures and seminars 21 h, exercises 14 h, 1st period.	
	Lectures and seminars 21 h, exercises 14 h, practical assignment, 2nd period. Exam.	
Assessment	0 - 5. Exam 100 %. Seminar presentation. Practical assignment.	
Course Material	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 CT20A2700 Tietokonegrafiikan perusteet, CT20A3100 Introduction to Machine Vision and Machine Learning, CT20A6000 Pattern Recognition, BM30A0500 Applied Optics.	

CT20A6200	***COMPUTER AND ROBOT VISION***	***7 ECTS cr***
	Computer and Robot Vision, Tietokone- ja robottinäkö	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Senior Assistant, Docent, D.Sc. (Tech.) Ville Kyrki	
Aims	To understand the theoretical basis and motivation to use geometric and dynamic computer vision, to know the applications of vision in robotics, and to know the basics of using the methods in practice.	
Contents	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.	
Teaching Methods	Lectures 21 h, exercises 14 h, 1st period.	
	Lectures 21 h, exercises 14 h, 2nd period. Practical assignment. Exam.	
Assessment	0 - 5. Exam 50 %, exercises 50 %. Practical assignment.	
Course Material	Lecture notes.	
	Trucco, E., Verri, A.: Introductory Techniques for 3-D Computer Vision, Prentice-Hall, 1998.	
Prerequisites	Matematiikka A and B, CT20A0200 Ohjelmoinnin perusteet.	
	Recommended CT20A3100 Introduction to Machine Vision and Machine Learning, BM20A1400 Tilastomatematiikka I, BM20A1500 Numeerinen analyysi I, BM20A1600 Matriisilaskenta.	

CT20A6300	EVOLUTIONARY ALGORITHMS 5 ECTS cr
	Evolutionary Algorithms, Evoluutioalgoritmit
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Lecturer, D.Sc. (Econ. & Bus. Adm.) Jouni Lampinen
Aims	Familiarize with the basics and applications of evolutionary algorithms. Learn to apply, implement, and modify evolutionary algorithms. Learn their application areas and restrictions. Learn to apply evolutionary algorithms to complex problems and to solve practical problems in the student's own specialization.
Contents	Introduction to evolutionary algorithms and their applications. Evolutionary algorithms in learning, intelligent, adaptive, and self-organizing systems. Structure, components, and characteristics of evolutionary algorithms. Genetic algorithms and evolutionary strategies. Evolutionary problem solving, searching, and optimization. Design and implementation of an information system applying evolutionary algorithms. Practical problem solving using evolutionary algorithms.
Teaching Methods	Lectures 28 h, 1st period. Exercises 10 h, 2nd period. Project work seminars 7 h, 2nd period. Project work. Exam.
Assessment	0 - 5. Exam 100 %. Project work.
Course Material	Haupt, R.L., Haupt, S.E.: Practical Genetic Algorithms, Wiley, 1998. Eiben, A.E., Smith, J.E.: Introduction to Evolutionary Computing, Springer-Verlag, 2003. Price, K.S., Storn, R.M., Lampinen, J.A.: Differential Evolution, A Practical Approach to Global Optimization, Springer, 2005. Other material given in lectures.
Prerequisites	Programming using a procedural language, e.q. C, FORTRAN, Pascal, Basic, etc., CT20A0200 Ohjelmoinnin perusteet, CT20A0210 Käytännön ohjelmointi. Recommended CT20A2310 Tietorakenteet ja algoritmit, BM20A2800 Nonlinear Optimization.

CT20A6400	LANGUAGES, COMPILERS AND INTERPRETERS 5 ECTS cr
	Languages, Compilers and Interpreters, Kielet, kääntäjät ja tulkit
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Researcher/Teacher, Docent, D.Sc. (Tech.) Joni Kämäräinen
Aims	To familiarize the student with theory of compilers and languages for selected formal languages.
Contents	Languages and grammars. Regular languages and lexical analysis. Introduction to parsing. Tools for compiler generation. Syntax directed translation, attribute grammars, intermediate representation. Machine independent optimization.
Teaching Methods	Lectures 21 h, exercises 14 h, 3rd period. Lectures 21 h, exercises 14 h and a terminal project, 4th period. Exam.
Assessment	0 - 5. Exam 100 %. Project.
Course Material	Aho, A.V., Sethi, R., Ullman, J.D.: Compilers: Principles, Techniques, and Tools, Addison Wesley, 1987.
Prerequisites	CT20A2000 Tietojenkäsittelyn perusteet I, CT20A2310 Tietorakenteet ja algoritmit.

CT20A7000	INFORMATION SYSTEMS RESEARCH 7 ECTS cr
	Information Systems Research, Tietojärjestelmien tutkimus
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Lecturer, D.Sc. (Tech.) Erja Mustonen-Ollila
Aims	Getting familiar with the IS research methods, the IS research approaches, reference literature, data collection, data validation, and data reliability issues,

	statistical analyses, a research proposal and a scientific report writing procedures. Promoting the publishing procedures, and understanding the different stages of the research process. Applying qualitative and quantitative research approaches, and discovering the proper research questions or the hypotheses, and the research problems. Finding out the suitable research organisations, or partners, and a research topic. The main goal is that the student is capable independently together with the supervisor to continue her/his M.Sc. and/or Ph.D. research study in the area of Information Systems, Software Engineering, or some reference disciplines.
Contents	Qualitative and quantitative research. IS research methods, and approaches. Constructing a conceptual framework, the research models, and the concepts. Data gathering techniques, data validation and reliability. Measurement. Statistical processing of observations. Research philosophies and philosophical methods. Scientific writing and the process of writing. The content of the research proposal. The content of a working paper. Publication procedures.
Teaching Methods	Lectures 21 h, exercises 14 h, 1st period. Lectures 21 h, exercises 14 h , 2nd period. Practical assignment (research proposal). Exam.
Assessment	0 - 5. Exam 50 %, practical assignment 50 %.
Course Material	Mumford, Hirshheim, Fitzgerald, Wood-Harper (ed.): Research Methods in Information Systems, 1985. Nissen, H.-E., Klein, H.K., Hirschheim, R. (ed.): Information Systems Research: Contemporary Approaches & Emergent Traditions, 1991. Boland, R.J., Hirschheim, R.A. (ed.): Critical Issues in Information Systems Research, Wiley, 1987. The Information Systems Research Challenge (Harvard 1989): Vol. 1: Qualitative Research Methods (ed. Cash, J.I., Lawrence, P.R.), Vol. 2: Experimental Research Methods (ed. Benbasat, I.), Vol. 3: Survey Research Methods (ed. Kraemer, K.L.). Järvinen, P.: On Research Methods, Opinpaja, 2004. Scientific articles in each of the sub areas.
Prerequisites	CT20A4000 Ohjelmistotuotanto.

CT20A7200	***ARCHITECTURE IN SYSTEMS AND SOFTWARE DEVELOPMENT*** ***5 ECTS cr***
	Architecture in Systems and Software Development, Arkkitehtuuri järjestelmien ja ohjelmistojen kehityksessä
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(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.
Contents	The role of architecture in development. Software architecture. Systems architecture. Enterprise architecture. Application integration. Architecture design. Architecture documentation. Architectural styles and patterns.
Teaching Methods	Lectures, lecture exercises and presentations at lectures 21 h, 3rd period. Lectures, lecture exercises and presentations at lectures 21 h, 4th period. Practical assignment and presentation. Exam.
Assessment	0 - 5. Exam 50 %, practical assignment 30 %, presentation 20 %.
Course Material	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	CT20A4100 Ohjelmistotuotannon menetelmät or equivivalent.

CT20A7300	*SOFTWARE QUALITY, PROCESSES, AND ORGANIZATIONS* *5 ECTS cr*
	Software Quality, Processes, and Organizations, Ohjelmistojen laatu, prosessit ja organisaatiot **To be lectured first time in fall 2008.**
Year and Period	M.Sc. (Tech.) 2, Period 1-2
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Uolevi Nikula
Aims	After the course student can explain quality, process, and organization related issues in software development and how such issues can be solved based on literature. Students can also synthesize the studied literature and develop quality and process documentation for a software company.
Contents	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.
Teaching Methods	Lectures and seminars 21 h, 1st period. Lectures and seminars 21 h, 2nd period. Two projects and two presentations. Exam.
Assessment	0 - 5. Exam 50 %, projects 30 %, presentation 20 %.
Course Material	To be announced at lectures.
Prerequisites	CT20A4100 Ohjelmistotuotannon menetelmät or equivivalent.

CT30A2700	*NETWORK DESIGN AND TRAFFIC ENGINEERING* *5 ECTS cr*
	Network Design and Traffic Engineering, Verkkosuunnittelu
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Kari Heikkinen
Aims	To make students familiar with fundamental methods in the design of telecommunication networks and traffic engineering.
Contents	Introduction to the network planning problem, network algorithms, network reliability, capacity planning, network optimization, and traffic engineering.
Teaching Methods	Lectures 7 h, exercises 14 h, 3rd period. Lectures 7 h, exercises 14 h and practical assignment, 4th period. Exam.
Assessment	0 - 5. Exam 50 %, exercises 50 %. Practical assignment.
Course Material	Robertazzi, T.G.: Planning Telecommunication Networks, IEEE Press, 1999. Kenyon, T.: High Performance Data Network Design, Butterworth-Heinemann, 2000.

CT30A5000	*NETWORK PROGRAMMING* *5 ECTS cr*
	Network Programming, Tietoliikenneohjelmointi
Year and Period	B.Sc. (Tech.) 3, Period 2-3
Lecturer(s)	Researcher/Teacher, Docent, D.Sc. (Tech.) Jouni Ikonen
Aims	Understand problematics of networked applications. Ability to read and implement protocols described in standards.
Contents	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.
Teaching Methods	Lectures 14 h, exercises 10 h, 2nd period. Exercises 8 h, 3rd period. 6 practical assignments. Final assignment. Assignments can not be combined from multiple years.
Assessment	0 - 5. Practical assignments 70 %, final assignment 30 %. Exercises.
Course Material	Stevens, W.R.: Unix Network Programming, The Sockets Networking API, Vol. 1, 3rd Ed., Prentice Hall, 2004.

Prerequisites	Internetworking with TCP/IP Vol. 3: Client-Server Programming and Application, Linux/POSIX Socket Version (Comer, D.E., Stevens, D.), 2000. C-language. Basic unix workstation usage skills. Recommended CT20A3000 Unix and System Programming, CT30A2500 TCP/IP -perusteet.

CT30A5800	***COMMUNICATIONS SOFTWARE AND ARCHITECTURE***	***5 ECTS cr***
	Communications Software and Architecture, Tietoliikenneohjelmistot	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Assistant, M.Sc. (Tech.) Oleg Chistokhvalov	
Aims	To give a student the basic knowledge about software, design and development.	
Contents	Message Sequence Chart, Finite State Machines, Petri Nets, Specification and Description Language, Abstract Syntax Notation 1, Protocol Design, Implementation and Verification, Protocol Layering Concept, Client/Server Paradigm, Protocol Standards.	
Teaching Methods	Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, exercises 14 h, project assignment, extra tasks, 2nd period. Exam.	
Assessment	0 - 5. Exam 70 %, project 30 %.	
Course Material	Lecture hand-outs.	
Prerequisites	Recommended CT20A4000 Ohjelmistotuotanto, CT30A2000 Tietoliikennetekniikan perusteet 1, CT30A2300 Tietokoneverkot ja datasiirto.	

CT30A5900	***COMMUNICATION SOFTWARE LABORATORY WORK***	***5 ECTS cr***
	Communication Software Laboratory Work, Protokollaohjelmointi	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Assistant, M.Sc. (Tech.) Oleg Chistokhvalov	
Aims	To give a student the basic knowledge about a practical definition and realisation of communications and ability to apply this knowledge for the carrying out of software communications.	
Contents	The course includes practical laboratory assignments that deal with usage, design and implementation of protocol software. Protocol software design, implementation, and testing using C/C++/Java programming languages in a development environment (CVOPS/OVOPS/JVOPS).	
Teaching Methods	Laboratory demonstrations 14 h, 3rd period. Laboratory demonstrations 14 h, practical assignment, 4th period.	
Assessment	Project passed/failed.	
Course Material	Lecture hand-outs.	
Prerequisites	CT30A5800 Communications Software and Architecture. Recommended CT20A2310 Tietorakenteet ja algoritmit, CT20A2400 Olio-ohjelmoinnin perusteet, CT20A3000 Unix and System Programming, CT30A2000 Tietoliikennetekniikan perusteet 1, CT30A2300 Tietokoneverkot ja datasiirto.	

CT30A6200	***MOBILITY MANAGEMENT***	***4 ECTS cr***
	Mobility Management, Liikkuvuuden hallinta **The course will be lectured next time during the academic year 2007 - 2008.**	
Year and Period	M.Sc. (Tech.) 2, Period 1	
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Pekka Jäppinen	
Aims	The aim is to familiarize the student with fundamentals of mobility management, providing basic understanding about its architectures, problems	

	and possible solutions.
Contents	Basic principles of Mobility Management. The most essential mobility management related protocols, such as Mobile IP. Mobility management technologies using on different protocol layers.
Teaching Methods	Lectures 28 h, 1st period. Practical assignment. Exam.
Assessment	0 - 5. Exam 80 %, practical assignment 20 %.
Course Material	Lecture material announced on lectures. Supplementary literature: Soliman, Hesham: Mobile IPv6 - Mobility in a Wireless Internet, Addison-Wesley, 2004.
Prerequisites	CT30A2500 TCP/IP -perusteet, CT30A2600 Langaton tietoliikenne.

CT30A6500	***PERFORMANCE ANALYSIS OF TELECOMMUNICATION SYSTEMS*** ***5 ECTS cr***
	Performance Analysis of Telecommunication Systems, Suorituskykyanalyysi **The course will be lectured next time during the academic year 2008 - 2009.**
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Lecturer(s) responsible: Professor, D.Sc. (Tech.) Jari Porras
Aims	To describe the basic methods for modelling of computer and telecommunication systems.
Contents	Markov Chains, Stochastic Petri Nets, Queueing Systems.
Teaching Methods	Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, exercises 14 h and practical assignment, 2nd period. Exam.
Assessment	0 - 5. Exam 100 %. Practical assignment.
Course Material	Ghanbari, M. et al.: Principles of Performance Engineering for Telecommunication and Information Systems, CRC Press, 1997. Cassandras, C.G., Lafortune, S.: Introduction to Discrete Event Systems, Kluwer Academic Publishers, 1999.

CT30A6700	***GROUP WORK COURSE ON COMMUNICATIONS SOFTWARE*** ***8 ECTS cr***
	Group Work Course on Communications Software, Tietoliikenteen ryhmätyökurssi **The course will be lectured next time during the academic year 2007 - 2008.**
Year and Period	M.Sc. (Tech.) 1, Period 1-4
Lecturer(s)	Part-time Untenured Teacher, Petri Heinilä Lecturer(s) responsible: Lecturer, D.Sc. (Tech.) Arto Kaarna
Aims	To exercise skills and knowledge on large project work on protocol and software development, implementing communications software systems. To study different methods in communications software specification, design and implementation. The course is very practical.
Contents	Particular communications software system is specified, designed and implemented with different methods (eg. UML, SDL, Java, C, C++, CVOPS). Software system is implemented as a large multi group project work during the year. The implementations made have to be working together.
Teaching Methods	Lectures 6 h, exercises 14 h, 1st period. Lectures 4 h, exercises 14 h, 2nd period. Lectures 4 h, exercises 14 h, 3rd period. Lectures 4 h, exercises 14 h, 4th period. Independent group work 150 h. Course is given only if there are enough students enrolled.

Assessment	0 - 5. Activity 30 %, implementations 50 %, group work 20 %.
Course Material	Will be announced on lectures.
Prerequisites	Recommended CT20A2400 Olio-ohjelmoinnin perusteet, CT20A3000 Unix and System Programming, CT20A4100 Ohjelmistotuotannon menetelmät, CT20A4400 Projektinhallinta, CT30A5000 Network Programming, CT30A5800 Communications Software and Architecture.

CT30A7000	***PARALLEL COMPUTING***	***6 ECTS cr***
	Parallel Computing, Rinnakkaislaskennan perusteet	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Jari Porras	
Aims	Student understands the meaning, concepts as well as applications of parallel and distributed computing. He/she also knows different architectures and their usage. Student can implement simple parallel programs and utilize parallel methods on their own work.	
Contents	Emerging need for parallel computing, parallel architectures and their classification, performance meters and scalability as well as a general view of programming in a parallel environment.	
Teaching Methods	Lectures 28 h, exercises 14 h, 1st period. Seminars 21 h, exercises 14 h, practical assignments, 2nd period. Exam.	
Assessment	0 - 5. Exam 50 %, presentation 25 %, practical assignments 25 %.	
Course Material	Grama, A. et al.: Introduction to Parallel Computing, Addison-Wesley, 2003.	
Prerequisites	Recommended CT20A2600 Käyttöjärjestelmät, CT20A3000 Unix and System Programming.	

CT30A7100	***PARALLEL PROGRAMMING***	***5 ECTS cr***
	Parallel Programming, Rinnakkaisohjelmoinnin perusteet	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Assistant, M.Sc. (Tech.) Jani Peusaari	
Aims	Student knows the difference between sequential and parallel programming and can implement advanced programs using multiple programming models. Student knows how to utilize essential features, e.g. optimized communication and load balancing, of parallel computing. He/she can also use specific tools that aid in debugging and analyzing parallel programs.	
Contents	Principles of parallel programming, differences between processes and threads. Usage of a cluster of workstations as a parallel programming environment. Programming using distributed libraries (PVM, MPI) and shared memory libraries (POSIX threads, OpenMP.) Debugging and analysis of parallel programs.	
Teaching Methods	Lectures 14 h, exercises 14 h, practical assignments, 3rd period. Exercises 14 h, practical assignments, 4th period. Exam.	
Assessment	0 - 5. Practical assignments 100 %.	
Course Material	Foster, I.: Designing and building parallel programs, Addison-Wesley, 1995. Andrews, G.: Foundations of Multithreaded, Parallel and Distributed Programming, Addison-Wesley, 2000. Pacheco, P.: Parallel programming with MPI, Morgan Kaufmann Publishers, 1997. Butenhof, D.: Programming with POSIX threads, Addison-Wesley, 1997. Chandra R. et al.: Parallel Programming in OpenMP, Morgan Kaufman Publ., 2001. Lecture hand-outs.	
Prerequisites	Recommended CT20A2600 Käyttöjärjestelmät, CT20A3000 Unix and System Programming, CT30A7000 Parallel Computing.	

CT30A7200	*DESIGN OF PARALLEL ALGORITHMS* *5 ECTS cr*
	Design of Parallel Algorithms, Rinnakkaisalgoritmien suunnittelu **The course will be lectured next time during the academic year 2008 - 2009.**
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Jari Porras
Aims	Student knows the obstacles and methods of parallel algorithm design. Through these skills student can solve problems and implement algorithms that solve those problems in parallel environments.
Contents	Methods for the parallel algorithm design, design and analysis of parallel algorithms, parallel algorithms in different parallel environments. Algorithms are selected each year separately.
Teaching	Lectures 2 h, 3rd period.
Methods	Lectures 2 h, practical exercise, 4th period. Independent reading and exercises. Oral exam.
Assessment	0 - 5. Oral exam, practical exercise.
Course Material	Jaja, J.: An Introduction to Parallel Algorithms, Addison-Wesley, 1992. Grama, A. et al.: Introduction to Parallel Computing, Addison-Wesley, 2003.
Prerequisites	Recommended CT20A2300 Algoritmien suunnittelu, CT30A7000 Parallel Computing, CT30A7100 Parallel Programming.

CT30A7300	*ADVANCED PARALLEL COMPUTING* *5 ECTS cr*
	Advanced Parallel Computing, Rinnakkaislaskennan jatkokurssi **The course will be lectured next time during the academic year 2007 - 2008.**
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Jari Porras
Aims	Gives an advanced view to the problems and needs of parallel computing in the modern world.
Contents	Selected each year separately.
Teaching	Lectures 14 h, exercises 14 h, discussions, group works, 3rd period.
Methods	Lectures 14 h, exercises 14 h, discussions, group works, practical assignment, 4th period. Exam.
Assessment	0 - 5. Exam, discussions, group works, practical assignment.
Course Material	Will be announced on lectures.
Prerequisites	Recommended CT30A7000 Parallel Computing, CT30A7100 Parallel Programming.

CT30A7400	*DISTRIBUTED OBJECT PROGRAMMING* *6 ECTS cr*
	Distributed Object Programming, Hajautettu objektiohjelmointi
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Jari Porras
Aims	To introduce the student to the object-oriented design and open distributed processing based digital communication architectures and design methodology.
Contents	Object-oriented systems, application level distribution and architectures in communication, remote procedure calls, service and interface descriptions, application data representation, object discovery services, related design patterns. Some (eg. CORBA, WebServices) distributed programming environment implementation is used to express concepts and practices of the distributed system.
Teaching	Lectures 14 h, exercises 14 h, homeworks, 1st period.

Methods	Lectures 14 h, exercises 14 h, homeworks, project work, 2nd period. Exam.
Assessment	0 - 5. Exam 50 %, project work 36 %, homeworks 14 %.
Course Material	Lecture notes.
Prerequisites	Recommended CT20A2410 Olio-ohjelmointi, CT20A4000 Ohjelmistotuotanto, CT30A2000 Tietoliikennetekniikan perusteet 1, CT30A5000 Network Programming.

CT30A8300	***WIRELESS SERVICE ENGINEERING***	***5 ECTS cr***
	Wireless Service Engineering, Langattomien palveluiden tekniikka **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Pekka Jäppinen	
Aims	To understand the challenges that wireless communication technologies and mobile devices provide to service development. To learn methods to improve the use of wireless services.	
Contents	Wireless service types: fixed services, mobile Internet services, ad hoc services, mobile p2p, ubiquitous services, environment services. The service perspective to mobile devices and wireless network technologies. Service discovery methods. Service enhancing technologies: adaptation and personalisation, context awareness, location.	
Teaching Methods	Lectures 21 h, demonstrations 14 h, exercises 14 h, practical assignment, 1st period. Practical assignment, 2nd period. Exam.	
Assessment	0 - 5. Exam 50 %, practical assignments 50 %.	
Course Material	Will be announced on lectures.	
Prerequisites	CT30A2600 Langaton tietoliikenne, CT30A5000 Network Programming. Recommended CT30A5200 Symbian-ohjelmointi, CT30A5800 Communications Software and Architecture.	

CT30A8800	***SECURED COMMUNICATIONS***	***6 ECTS cr***
	Secured Communications, Suojatut tietoyhteydet **The course will be lectured next time during the academic year 2007 - 2008.**	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Pekka Jäppinen	
Aims	To learn how to secure the communication channel between communicating devices.	
Contents	Security risks against communication channel. Creation of secure communication channel. Cryptographic methods: Symmetric and asymmetric encryption algorithms, hash functions, key exchange methods. Authentication methods. Digital signatures.	
Teaching Methods	Lectures 14 h, exercises 14 h, 1st period. Lectures 8 h, seminars 20 h, practical assignment, 2nd period. Exam.	
Assessment	0 - 5. Exam 40 %, seminars 30 %, practical assignment 30 %.	
Course Material	Trappe W., Washington L.C.: Introduction to Cryptography with Coding Theory. Schneier, B.: Applied Cryptography, Wiley, 1996. Kerttula, E.: Tietoverkkojen tietoturva, 2. painos, Edita, 2000. Lecture hand-outs.	
Prerequisites	CT30A3500 Tietoturvan perusteet. Recommended CT30A2500 TCP/IP -perusteet, CT30A5000 Network Programming.	

5 CBU Master's Degree Programme in Information and Communications Technology

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

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

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

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

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

Levels of collaboration of the CBU ICT-pilot Master's Programme

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

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

Master of Science 120 ECTS cr

ECTS cr	
General Studies	31
Major Subject	60
Minor Subject	20
Elective Studies	9
Total	*120 ECTS cr (at least)*

General studies 31 ECTS cr

Information Processing

Compulsory studies		*year*	*per.*	*ECTS cr*
FV11A9000	Academic Seminar for International Programs	1	1 – 2	6
FV…	Language studies *			2
BK10A0300	Introduction to MSc Studies	1	1 – 2	1
CT20A3000	Unix and System Programming	1	2 – 3	5
CT20A6400	Languages, Compilers and Interpreters	1	3 – 4	5
CT20A2500	Object-Oriented Programming Techniques	1	1 – 2	5
	CBU Summer/Winter School courses**	1-2		7

*) The course FV13A1200 Teknisk svenska is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.
*) The course FV18A9100 Finnish for Foreigners 1 is obligatory for foreign students.
**) CBU summer schools and winter schools contain several special courses, from which the student selects at least 7 ECTS cr. The CBU Summer and Winter Schools are organised in cross-border collaboration as one-week intensive lecturing in one of the CBU-ICT partner universities alternately. Studies exceeding 7 ECTS cr may be included as elective courses in the major subject.

Communications Engineering

Compulsory studies		*year*	*per.*	*ECTS cr*
FV11A9000	Academic Seminar for International Programs	1	1 – 2	6
FV…	Language studies *			2
BK10A0300	Introduction to MSc Studies	1	1 – 2	1
CT30A2700	Network Design and Traffic Engineering	1	3 – 4	5
CT30A5800	Communications Software and Architectures	1	1 – 2	5
CT30A5900	Communications Software Laboratory Work	1	3 – 4	5
	CBU Summer/Winter School courses **	1-2		7

*) The course FV13A1200 Teknisk svenska is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.
*) The course FV18A9100 Finnish for Foreigners 1 is obligatory for foreign students.
**) CBU summer schools and winter schools contain several special courses, from which the student selects at least 7 ECTS cr. The CBU Summer and Winter Schools are organised in cross-border collaboration as one-week intensive lecturing in one of the CBU-ICT partner universities alternately. Studies exceeding 7 ECTS cr may be included as elective courses in the major subject

Major in Information Processing 60 ECTS cr

The major subject is to be chosen at the beginning of the studies when students prepare an individual study plan (HOPS).

Compulsory studies 38 ECTS cr		*year*	*per.*	*ECTS cr*
CT10A9500	Research Methods	1	1	3
CT10A9600	Research Methods Laboratory Project*	1	2 – 4	5
	Master's Thesis*	2		30

Courses marked with *) are carried out in cross-border collaboration.

Elective studies		*year*	*per.*	*ECTS cr*
CT20A6000	Pattern Recognition	1	3 – 4	7
CT20A6100	Machine Vision and Digital Image Analysis	1	1 – 2	7

CT20A6200	Computer and Robot Vision	1	1 – 2	7
CT20A6300	Evolutionary Algorithms	1	1 – 2	5
CT20A7000	Information Systems Research	1	1 – 2	7
CT20A7200	Architecture in Systems and Software Development	1	3 – 4	5
		1	1 – 2	5
CT20A7300	Software Quality, Processes, and Organizations		2	2
CT10A9700	Summer School on Communications Engineering	2		2
	ECSE International Summer School in Novel Computing			
	CBU Winter/Summer School courses **			
	Courses offered by CBU Universities ***			

** Additional credits not included in the general studies.
*** See the newest list at the CBU-ICT website. The suitability of the course for your major should be verified beforehand from Dr. Pekka Jäppinen.

Major in Communication Technology 60 ECTS cr

The major subject is to be chosen at the beginning of the studies when students prepare an individual study plan (HOPS).

Compulsory studies 38 ECTS cr		*year*	*per.*	*ECTS cr*
CT10A9500	Research Methods	1	1	3
CT10A9600	Research Methods Laboratory Project*	1	2 – 4	5
	Master's Thesis*	2		30

Courses marked with *) are carried out in cross-border collaboration.

Elective studies		*year*	*per.*	*ECTS cr*
CT30A6200	Mobility Management (will be lectured during the academic year 2007 – 2008)			4
CT30A6500	Performance Analysis of Telecommunication Systems	1	1 – 2	5
CT30A6700	Group Work Course on Communications Software	1	1 – 4	8
CT30A7000	Parallel Computing	1	1 – 2	6
CT30A7100	Parallel Programming	1	3 – 4	5
CT30A7200	Design of Parallel Algorithms	1	3 – 4	5
CT30A7300	Advanced Parallel Computing (will be lectured during the academic year 2007 – 2008)			5
CT30A7400	Distributed Object Programming	1	1 – 2	6
CT30A8300	Wireless Service Engineering	2	1 – 2	5
CT30A8800	Secured Communications	1	1 – 2	6
CT10A9700	Summer School on Communications Engineering	2		2
	ECSE International Summer School in Novel Computing	2		2
	CBU Winter/Summer School courses **			
	Courses offered by CBU universities ***			

** Additional credits not included in the general studies.
*** See the newest list at the CBU-ICT website. The suitability of the course for your major should be verified beforehand from Dr. Pekka Jäppinen.

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 in Cross Border Studies 20 ECTS cr
Students must choose 20 cr from the courses lectured at the Russian CBU-ICT partner universities

Elective Studies
To attain the full 120 ECTS cr, students may need to take some additional courses. Elective studies can include any courses offered by LUT or another CBU-ICT university.

Complementary Studies
Students with a Finnish polytechnic degree or equivalent will have to complete complementary studies. They are not included in the Master's degree.

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

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

6 Master's Degree Programme in Electrical Engineering

The Master's degree programme in electrical engineering is structured around a series of discipline specific study programs. The degree program provides training in the discipline

- Electrical engineering
- Technomathematics
- Technical physics

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

Electrical Engineering - The Aim of the Programme

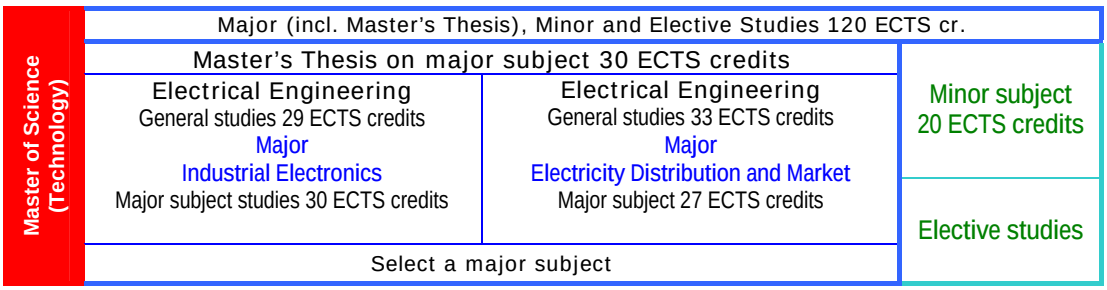
The programme is specifically aimed at students who wish to receive multiple and goal-directed training in electrical engineering technology. It focuses on preparing students to be professionally and academically prepared to address the needs of international entrepreneurial companies seeking for networking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

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

- Electrical drives technology - the studies focus on the management of electromagnetism, power electronics, electromechanical and electrothermal processes.
- Control engineering engineering - the studies concentrate on the industrial applications of real-time control systems, embedded software, digital signal processing, and on the application of these to the modeling and control of electric drives and power electronics.
- Electricity distribution and market - the studies focus on electricity distribution automation and power transmission, network business technology, regulation, and economy

The Degree Structure

Depending on the degree and/or on the level and extent of studies the student has obtained from his or her home university and based on his or her field of interest and specialization, **for every admitted student will be composed an individual study program**. The study programme in electrical engineering is structured of following subject blocks:



One major and one minor subject have to be chosen from the technology fields in electrical engineering. Economics and languages must be chosen as a minor subject only.

Industrial Electronics

General Studies

		per.	ECTS cr
FV11A9000	Academic Seminar for International Programs	2–4	6
BM20A1300	Complex Analysis	3	3
BM20A1900	Statistics II	2	3
BM20A2700	Numerical Analysis II	3	3
BM20A2800	Nonlinear Optimization	4	4
FV18A9100	Finnish for Foreigners 1	1, 3	2
FV18A9200	Finnish for Foreigners 2	2, 4	2
BH50A1200	Energy Systems Engineering	1-2	6

Major Studies

		per.	ECTS cr
BL30A0400	Design of an Electrical Machine	1	6
BL30A0600	Power Electronics	1-2	6
BL30A1010	Seminar Course in Electrical Drives	1	4
BL30A1200	Numerical Methods in Electromagnetism	3	4
BL40A1000	Real-time Operating Systems and Programs	1-2	5
BL40A1100	Embedded System Programming	1-2	4
BL40A1200	Digital Control Design	1-2	4
BL50A0600	Electromagnetic compatibility in power electronics	1	2
Thesis	Master's Thesis		30

Minor Studies

		per.	ECTS cr
BL40A1810	Microprocessors A	3-4	6
BL40A1900	Advanced Course in Electronics	3-4	6
BL60A0200	Microelectronics	3	6
BL60A0300	Computer Architecture	1	6

Alternatively to the minor subject suggested in the study programme the student can choose any minor subject taught in English at LUT.

Elective Studies

		per.	ECTS cr
CS10A0050	Introduction to International Business	4	4
CS10A0300	Business Forecasting	1	4
CS10A0850	Transitional Countries Integration with the European Union - Trade, Manufacturing and Labour Perspective	4	5
CS34A0500	Technology Commercialization and Corporate Venturing	4 int.	5
AB30A0300	International Finance and Emerging Markets	2	5
FV11A9300	Scientific and Technical English Writing Course	3–4	4

To attain the full degree amount of 120 ECTS credits the student needs to take some additional courses. Elective studies can include any courses taught in English at LUT if the required prerequisites are completed.

Electricity Distribution and Market

General Studies

		per.	*ECTS cr*
FV11A9000	Academic Seminar for International Programs	2–4	6
BM20A1900	Statistics II	2	3
AB30A0300	International Finance and Emerging Markets	2	5
BM20A1300	Complex Analysis	3	3
BM20A2700	Numerical Analysis II	3	3
BM20A2800	Nonlinear Optimization	4	4
BH50A1200	Energy Systems Engineering	1-2	6
FV18A9100	Finnish for Foreigners 1	1, 3	2
FV18A9200	Finnish for Foreigners 2	2, 4	2

Major Studies

		per.	*ECTS cr*
BL20A0201	Power exchange game for electricity markets	2-3	3
BL20A0401	Electricity market	1	5
BL20A0501	Electricity distribution technology	2-3	8
BL20A0601	Electrical power transmission	2	5
BL30A0600	Power Electronics	1-2	6
Thesis	Master's Thesis		30

Minor Studies

		per.	*ECTS cr*
BL30A1010	Seminar Course in Electrical Drives	1	4
BL30A1200	Numerical Methods in Electromagnetism	3	4
BL40A1100	Embedded System Programming	1-2	4
BL40A1810	Mikroprosessorit A	3-4	6
BL50A0600	Electromagnetic compatibility in power electronics	1	2

Alternatively to the minor subject suggested in the study programme the student can choose any minor subject taught in English at LUT.

Elective Studies

		per.	*ECTS cr*
CS10A0050	Introduction to International Business	4	4
CS10A0300	Business Forecasting	1	4
CS10A0850	Transitional Countries Integration with the European Union - Trade, Manufacturing and Labour Perspective	4	5
CS34A0500	Technology Commercialization and Corporate Venturing	4 int.	5
FV11A9300	Scientific and Technical English Writing Course	3–4	4

To attain the full degree amount of 120 ECTS credits the student needs to take some additional courses. Elective studies can include any courses taught in English at LUT if the required prerequisites are completed.

The Courses Offered in English

		ECTS cr
BL10A5000	Basic Finnish course for Russian-speaking students	2
BL20A0201	Power exchange game for electricity markets	3
BL20A0401	Electricity market	5
BL20A0501	Electricity distribution technology	8
BL20A0601	Electrical power transmission	5
BL30A0400	Design of an Electrical Machine	6
BL30A0600	Power Electronics	6
BL30A1010	Seminar Course in Electrical Drives	4
BL30A1200	Numerical Methods in Electromagnetism	4
BL40A1000	Real-time Operating Systems and Programs	5
BL40A1100	Embedded System Programming	4
BL40A1200	Digital Control Design	4
BL40A1810	Microprocessors A	6
BL40A1900	Advanced Course in Electronics	6
BL40A2200	Process and Product Innovations	12
BL50A0600	Electromagnetic compatibility in power electronics	2
BL60A0200	Microelectronics	6
BL60A0300	Computer Architecture	6
BL60A0400	Physics of Semiconductor Devices	3 - 6
BL60A0500	CMOS Analog Circuit Design	3 - 6
BL60A0600	Analog Circuit Design	6
BL60A0700	Silicon VLSI Technology	3 - 6

Course Descriptions

BL10A5000	***BASIC FINNISH COURSE FOR RUSSIAN-SPEAKING STUDENTS 2 ECTS cr***
	Basic Finnish course for Russian-speaking students
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	M.A. Julia Vauterin Lecturer(s) responsible: Lecturer, Raija Hietaranta
Aims	The aims of the course are to introduce the student into the basics of the Finnish language, to give the student the skills to cope with simple everyday discussions, to offer exercises to assess the student's progress in studies and to encourage the student to learn Finnish independently with the support of internet courses.
Contents	Pronunciation, oral skills, listening comprehension, writing, reading and grammar.
Teaching Methods	28 h of tutorials, 1nd and 2rd period. Independent studies, group work, written assignment.
Assessment	0 - 5, active participation in class, examination in writing 100%
Course Material	Afanaseva Valentina, Razinov P.: Finskij jazyk dlja nachinajushchih. Other material to be distributed during the lectures.

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
Lecturer(s)	Lecturer(s) responsible: Professor, D.Sc. (Tech.) Jarmo Partanen
Aims	The course deepens the student's knowledge of the practical planning and implementation of electricity trade in the form of game training.

Contents	Planning of the procurement and sale of electricity, OTC markets, physical and financial products of power exchange, risk management on the electricity markets.
Teaching Methods	8 h of lectures, 40 h of game training that is carried out once a week in teams, 2nd and 3rd period. A final report in writing.
Assessment	0 - 5, final report in writing 100%
Course Material	Material to be distributed during the lectures.
Prerequisites	Electricity market

BL20A0401	***ELECTRICITY MARKET***	***5 ECTS cr***
	Electricity market	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Jarmo Partanen	
Aims	The course gives the student a basic knowledge of the fundamentals of electricity trade and the electricity distribution business as well as of the related objectives and implementations.	
Contents	The development of electricity markets, loads on the electricity network and load forecasts, power exchange, electricity trade, balance management, the fundamentals of pricing and the regulation of distubition business.	
Teaching Methods	28 h of lectures, 14 h of tutorials, 1st period. Independent studies. Written examination.	
Assessment	0 - 5, examination 100%.	
Course Material	Material to be distributed during the lectures.	

BL20A0501	***ELECTRICITY DISTRIBUTION TECHNOLOGY***	***8 ECTS cr***
	Electricity distribution technology	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Lecturer(s)	Lecturer(s) responsible: Professor, D.Sc. (Tech.) Jarmo Partanen	
Aims	The course provides the student with in-depth knowledge of the design and use of distribution networks.	
Contents	Network design; the use, protection, and automation of distribution networks; information systems of distribution companies.	
Teaching Methods	42 h of lectures, 28 h of tutorials, 2nd and 3rd period. Assignment. Written examination.	
Assessment	0 - 5, examination 100%. Satisfactorily completed assignment required.	
Course Material	Lakervi, Holmes: Electricity distribution network design (where applicable). Lakervi: Sähkönjakeluverkkojen suunnittelu, Otatieto.	
Prerequisites	Students are required to have completed Introduction to Electrical Power Systems, Electrical Power Transmission, and have attended the lectures of Electricity Markets.	

BL20A0601	***ELECTRICAL POWER TRANSMISSION***	***5 ECTS cr***
	Electrical power transmission	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Lecturer(s)	Lecturer(s) responsible: Professor, D.Sc. (Tech.) Jarmo Partanen	
Aims	This course provides the student with a basic knowledge of the design and use of electricity transmission networks.	
Contents	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.	
Teaching Methods	24 h of lectures, 14 h of tutorials, 2nd period. Written examination.	
Assessment	0 - 5, examination 100%.	
Course Material	Mörsky: Voimalaitosten yhteiskäytön tekniikka (Otatieto Moniste 549).	

Prerequisites	Mörsky: Relesuojaustekniikka. (Otatieto, moniste 540). Students are required to have completed Electric Circuits and attended the lectures of Introduction to Electrical Power Systems.

BL30A0400	***DESIGN OF AN ELECTRICAL MACHINE***	***6 ECTS cr***
	Design of an Electrical Machine **Suomenkielinen opetusmoniste sekä suomenkieliset harjoitustehtävät ovat saatavilla.**	
Year and Period	M.Sc. (Tech.) 2, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Pyrhönen	
Aims	The course will give the student a basic knowledge of the thorough calculation of an electric machine as well as the skills required in finding structural solutions based on desired machine characteristics. Further, the students are trained to compare these solutions by calculating, to utilise mathematical software in calculation, and to analyse the machine characteristics by measurements. The students are also acquainted with simulations as well as with the mechanical aspects of the machine design.	
Contents	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, effective-value phasor diagrams for different machine types, principles of electric machine design (induction motor).	
Teaching Methods	28 h of lectures, 28 h of tutorials, 1st period. The design assignment of an electric machine. Written examination.	
Assessment	0 - 5, written examination 100%. Satisfactorily completed assignment required.	
Course Material	Pyrhönen: Design of a rotating electric machine (Pyörivän sähkökoneen suunnitteleminen). Pyrhönen: Magneettiset materiaalit (where applicable). C.B. Gray: Electrical Machines and Drive Systems (where applicable).	
Prerequisites	Students are recommended to have completed Electric Circuits, Basics of Electric Engineering, and Laboratory Course in Electrical Engineering and attended the lectures of Electromagnetism.	

BL30A0600	***POWER ELECTRONICS***	***6 ECTS cr***
	Power Electronics	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Lasse Laurila	
Aims	The course provides the student with a good general knowledge of the different basic circuits in modern power electronics. The course acquaints students with the features and functions of different switch-mode converters and inverters. In addition, the course will offer an insight into the joint operation of static converters and load as well as the network interferences caused by converters and possibilities for reducing these interferences.	
Contents	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.	
Teaching Methods	14 h of lectures, 14 h of tutorials, 1st period 14 h of lectures, 14 h of tutorials, 2nd period. Written examination	
Assessment	0 - 5, written examination 100%	
Course Material	Mohan, Undeland, Robbins: Power Electronics, converters, applications, and design, where applicable.	
Prerequisites	Electric Circuits. Integration and derivation (esp. sine and cosine functions). FFT. Laplace transforms.	

BL30A1010	SEMINAR COURSE IN ELECTRICAL DRIVES 4 ECTS cr
	Seminar Course in Electrical Drives **The course is designed for students of the Master's degree programme in electrical engineering and for students and postgraduate students interested in the fundamental principles of electrical drives. It is an intensive overview of Sa271000 Sähkökäytöt and will be lectured only if required.**
Year and Period	M.Sc. (Tech.) 1, Period 1
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Pyrhönen
Aims	The course addresses the theory and operation of electrical motor drives. In particular, the course focuses on the operation of modern AC drives. The course is intended for persons working on controlled electrical drives. The course is an essential prerequisite for those involved in the CDMC co-operation.
Contents	Theory, operation and equivalent circuits of electrical motor drives. Fundamentals of space vector theory. Synchronous drive. Asynchronous drive. DC drive. Torque production mechanisms in different machines. Power electronic connections for motor control. Scalar control, vector control. Direct flux linkage control and direct torque control (DTC).
Teaching Methods	Intensive course. 3 sessions of 6 h lectures, 1 session of 6 h seminar, 1 session of 6 h tutorials, 1st period. Seminar work.
Assessment	0 - 5, seminar work 100%.
Prerequisites	The students are recommended to have completed the courses Electric Circuits, Basics of Electric Engineering, and Laboratory Course in Electrical Engineering, and to have attended the courses Design of an Electrical Machine and Power Electronic Components; Introduction to Electrical Drives, Electromagnetic Components.

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

BL40A1000	REAL-TIME OPERATING SYSTEMS AND PROGRAMS 5 ECTS cr
	Real-time Operating Systems and Programs
Year and Period	M.Sc. (Tech.) 2, Period 1-2
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Julius Luukko
Aims	The course provides the student with skills needed for constructing an application program of an embedded system by using real-time operating system as the architecture. The student is trained to utilise the services of a real-time operating system.
Contents	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.
Teaching	21 h of lectures, 14 h of tutorials, 1st period.
Methods	21 h of lectures, 14 h of tutorials, 2nd period. Written examination.
Assessment	0 - 5, examination 100%. Satisfactorily completed assignment required.
Course Material	Labrosse, J.J.: MicroC/OS-II The Real-Time Kernel (2nd Edition).
Prerequisites	Embedded System Programming.

BL40A1100	***EMBEDDED SYSTEM PROGRAMMING***	***4 ECTS cr***
	Embedded System Programming	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Tuomo Lindh	
Aims	The course provides the student with skills to apply C language and its structures in embedded system programming.	
Contents	Embedded system programming, design tools, C language in embedded system programming, the utilisation of microcontroller environment (registers, timers, buses, A/D conversion etc.). Typical data structures, typical program structures in real-time applications. Programming the Windows interface, basic properties of real-time operating systems.	
Teaching	14 h of lectures, 14 h of tutorials, 1st period.	
Methods	14 h of lectures, 14 h of tutorials, 2nd period. Assignment. Written examination.	
Assessment	0 - 5, examination 100%. Satisfactorily completed assignment required.	
Course Material	Wolf, W.: Computers as components: principles of embedded computing system design. Lecture notes.	
Prerequisites	Basics of C language, knowledge of the basic structure of microprocessors.	

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

BL40A1810	***MICROPROCESSORS A***	***6 ECTS***
Year and Period	3rd year**,** Period 3 - 4	
Lecturers	Professor, D.Sc. (Tech.) Jero Ahola	
Aims	The course acquaints the student with the functioning and use of microprocessor components. The course gives the students the skills to program and design embedded microcomputer systems.	
Contents	The architecture, instruction set and functioning of a microprocessor.	

	Microcontrollers. The structure and design of memory circuits and peripheral components. System design. Programming and development support. Application examples. An introduction to signal prosessors.
Course Work	3rd period: 14 h of lectures, 14 h of tutorials. 4th period: 14 h of lectures, 14 h of tutorials. Assignment. Written examination.
Course Material	Lecture notes.
Prerequisites	Basic Digital Circuits and Basic Electronics A + B, Fundamentals of Programming.

BL40A1900	***ADVANCED COURSE IN ELECTRONICS***	***6 ECTS cr***
	Advanced Course in Electronics	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Professor, D.Sc. (Tech.) Pertti Silventoinen	
Aims	During this course, the student will obtain a deep knowledge of a new topic in electronics. The course can also be included in post-graduate studies.	
Contents	The course contents are subject related and will be specified during the introductory lectures.	
Teaching Methods	2h of introductory lectures 2 h, 12 h of seminar presentations, 3rd period. 14 h of seminar presentations, 4th period. No written examination.	
Assessment	0 - 5, seminar presentation 100%.	

BL40A2200	***PROCESS AND PRODUCT INNOVATIONS***	***12 ECTS cr***
	Process and Product Innovations **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 students will be selected on the basis of applications.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4,1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Olli Pyrhönen, Researcher/Teacher, D.Sc. (Tech.) Riku Pöllänen, Professor, D.Sc. (Tech.) Tuomo Kässi, Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen, Researcher/Teacher, D.Sc. (Tech.) Ville Ojanen Lecturer(s) responsible: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	To get acquainted with the generation of innovations and new technology, the typical methods, problems and their solutions. To train project and teamwork in interdisciplinary, international environment. To get acquainted with product and process development. To train and deepen many skills learned in other connections.	
Contents	Methods of product and process development. Interdisciplinary R & D activities as project and teamwork. Development of new technology, patenting.	
Teaching Methods	Informational lectures, 6 h/period. Project meetings, 6 h/period. Independent project and teamwork in groups of 4-8 students approximately 300 h/student.	
Assessment	0-5, project work 100 %.	

BL50A0600	***ELECTROMAGNETIC COMPATIBILITY IN POWER ELECTRONICS***	***2 ECTS cr***
	Electromagnetic compatibility in power electronics	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Pertti Silventoinen	
Aims	This course provides the student with skills to understand the occurrence	

	mechanisms of interferences in power electronics, the effects of cable reflection, and the occurrence mechanisms and prevention of network harmonics.
Contents	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.
Teaching	14 h of lectures, 1st period.
Methods	An assignment to be completed as pair work. Written examination.
Assessment	0 - 5, written examination 100%. Satisfactorily completed assignment required.

BL60A0200	***MICROELECTRONICS***	***6 ECTS cr***
	Microelectronics **The course will be lectured in English if required.**	
Year and Period	M.Sc. (Tech.) 1, Period 3	
Lecturer(s)	Professor, Ph.D. Tuure Tuuva	
Aims	To acquaint students with integrated circuit technology and provide them with skills for analog IC design. Students will learn the most important variables and functions related to the components of integrated circuits. Components will be modelled with simulation programs. The assignment of IC design will be carried out with a suitable design program.	
Contents	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.	
Teaching	3rd period: 28 h of lectures, 28 h of tutorials.	
Methods	Assignment and its presentation. Written examination.	
Assessment	0 - 5, examination 100%. Satisfactorily completed assignment required..	
Course Material	Roger T. Howe, Charles G. Sodini: Microelectronics An Integrated Approach.	
Prerequisites	Students are recommended to have completed the courses Basic Course on Microelectronics, Analog Electronics, and Digital Electronics.	

BL60A0300	***COMPUTER ARCHITECTURE***	***6 ECTS cr***
	Computer Architecture **The course will be lectured in English if required.**	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, Ph.D. Tuure Tuuva	
Aims	To acquaint students with the components of a computer and the design aspects of different types of computers.	
Contents	The fundamentals of computer design and performance measurements. The Central Processing Unit (CPU), pipelining and multiprocessor systems, memory hierarchies. I/O, a look at the latest commercial processors as well as their applications and technologies.	
Teaching Methods	14 h of lectures, 1st period. Independent study and assignments. Written examination.	
Assessment	0 - 5, examination 100%. Satisfactorily completed assignment required.	
Course Material	Patterson, D.A., Hennessy, J.L.: Computer Architecture: A Quantitative Approach. Morgan Kaufmann, San Mateo, CA, 3. painos, 2002.	
Prerequisites	Students are recommended to have completed the courses Basic Digital Circuits and Microprocessors A.	

BL60A0400	***PHYSICS OF SEMICONDUCTOR DEVICES***	***3 - 6 ECTS cr***
	Physics of Semiconductor Devices	
Year and Period	M.Sc. (Tech.) 1-2	
Lecturer(s)	Professor, Ph.D. Tuure Tuuva, Assistant, M.Sc. (Tech.) Tanja Palviainen	

Aims	To provide the student with an in-depth knowledge of semiconductor devices and their operation.
Contents	Structure, operation and physics of semiconductor devices.
Teaching Methods	Special assignment.
Assessment	Evaluation pass/failed, special assignment 100%.
Course Material	Sze, Physics of Semiconductor Devices.

BL60A0500	***CMOS ANALOG CIRCUIT DESIGN***	***3 - 6 ECTS cr***
	CMOS Analog Circuit Design	
Year and Period	M.Sc. (Tech.) 1-2	
Lecturer(s)	Professor, Ph.D. Tuure Tuuva	
Aims	To provide the student with a knowledge of the IC design and characterization.	
Contents	CMOS circuit technology, analog IC design and device modelling.	
Teaching Methods	Special assignment	
Assessment	Evaluation pass/failed, special assignment 100%.	
Course Material	Allen, Holberg, CMOS Analog Circuit Design	

BL60A0600	***ANALOG CIRCUIT DESIGN***	***6 ECTS cr***
	Analog Circuit Design	
Year and Period	M.Sc. (Tech.) 1-2	
Lecturer(s)	Professor, Ph.D. Tuure Tuuva	
Contents	Special circuit applications, VCO, DA/AD converters and Chopper amplifiers	
Teaching Methods	Special assignment.	
Assessment	0 - 5, special assignment 100%.	
Course Material	Williams, Analog Circuit Design	
Prerequisites	Microelectronics	

BL60A0700	***SILICON VLSI TECHNOLOGY***	***3 - 6 ECTS cr***
	Silicon VLSI Technology	
Year and Period	M.Sc. (Tech.) 1-2	
Lecturer(s)	Professor, Ph.D. Tuure Tuuva, Assistant, M.Sc. (Tech.) Tanja Palviainen	
Aims	To provide students with a knowledge of the IC manufacturing techniques. Simulation of the manufacturing process or/and integrated circuit processing as a special assignment.	
Contents	Cleaning of semiconductor materials. Production of silicon wafers. Epitaxy. Diffusion. Ion implantation. Oxidization. Etching. Photolithography. Component manufacturing.	
Teaching Methods	Special assignment.	
Assessment	Evaluation pass/failed, special assignment 100%.	
Course Material	Silicon VLSI Technology: Fundamentals, Practice and Modelling, James D.Plummer, Michael D.Deal, Peter B.Griffin	

Technomathematics

Technomathematics is part of the two-year programme IMPEE for both Finnish and international students. Students majoring in Technomathematics should have a Bachelor's degree in engineering, applied mathematics, computer science or equivalent discipline. The programme is worth 120 credits and includes coursework of 90 credits and a Master's Thesis of 30 credits, leading to a Master of Science in Technology degree. Lectures and tutoring are given in English. The application period for the programme is in January-February annually.

The Aims

The aim is to develop the student's mathematical and computational skills for industry and other research and development tasks. The professional scope is wide-ranging and growing rapidly. Technomathematics is the art and science of applying mathematics and computational models into real life problems in industrial research and applied science, such as

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

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

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

Requirements in Basic Studies

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

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

Degree Structure		
General Studies	10	ECTS cr
Major Subject, obligatory studies	16	ECTS cr
Major Subject, elective modules	30	ECTS cr
Minor Subject	20	ECTS cr
Elective Studies	14	ECTS cr
Master's Thesis	30	ECTS cr
Total	*120 (min.)*	*ECTS cr*

General Studies 10 ECTS cr

Obligatory Studies (10 ECTS cr)		*year*	*per.*	*ECTS cr*
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
CT10A9500	Research Methods	M.Sc. (Tech.) 1	1	3
FV11A9000	Academic Seminar for International Programs		2–4	6

Major Subject, obligatory studies 16 + 30 ECTS cr

Obligatory Studies (46 ECTS cr)		*year*	*per.*	*ECTS cr*
BM20A2100	Differential Equations	M.Sc. (Tech.) 1-2	3	4
BM20A2200	Logic and Discrete Methods	M.Sc. (Tech.) 1	4	4
BM20A2500	Linear Algebra and Normed Spaces	M.Sc. (Tech.) 1-2	1	3
BM20A4000	Case Study Seminar	M.Sc. (Tech.) 1	1-4	5
Thesis	Master's Thesis			30

Major Subject, elective modules 30 ECTS cr
Choose two modules from a-d. The extent of each module should be at least 15 ECTS cr.

a) Computational Modelling of Technical Systems

Obligatory Studies (7 ECTS cr)		*year*	*per.*	*ECTS cr*
BM20A2700	Numerical Analysis II	M.Sc. (Tech.) 1	3	3
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1-2	4	4

Elective Studies		*year*	*per.*	*ECTS cr*
BM20A2000	Simulation	M.Sc. (Tech.) 1	1	4
BM20A2600	Integral Transforms	B.Sc. (Tech.) 3	4	3
BM20A3200	Fuzzy Engineering	M.Sc. (Tech.) 1-2	4	4
BM20A3800	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6

b) Data Analysis and Stochastics

Obligatory Studies (11 ECTS cr)		*year*	*per.*	*ECTS cr*
BM20A1900	Statistics II	M.Sc. (Tech.) 1-2	2	3
BM20A2900	Discrete Optimization	M.Sc. (Tech.) 1-2	4	4
BM20A3000	Statistical Analysis in Modelling	M.Sc. (Tech.) 1	2	4

Elective Studies		*year*	*per.*	*ECTS cr*
BM20A2000	Simulation	M.Sc. (Tech.) 1	1	4
BM20A3300	Stochastic Theory and Models	M.Sc. (Tech.) 1	4	3
BM20A3400	Design of Experiments	M.Sc. (Tech.) 1-2	4	3
BM20A3600	Fuzzy Data Analysis	M.Sc. (Tech.) 1-2	3	4
BM20A3800	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6

c) Discrete and Fuzzy Models and Methods

Obligatory Studies (8 ECTS cr)		*year*	*per.*	*ECTS cr*

BM20A2900	Discrete Optimization	M.Sc. (Tech.) 1-2	4	4
BM20A3100	Fuzzy Sets and Fuzzy Logic	M.Sc. (Tech.) 1-2	2	4

Elective Studies		*year*	*per.*	*ECTS cr*
BM20A3200	Fuzzy Engineering	M.Sc. (Tech.) 1-2	4	4
BM20A3600	Fuzzy Data Analysis	M.Sc. (Tech.) 1-2	3	4
BM20A3700	Fuzzy Decision Making	M.Sc. (Tech.) 1-2	2	4
BM20A3800	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6

d) Theory of Applied Analysis

Obligatory Studies (9 ECTS cr)		*year*	*per.*	*ECTS cr*
BM20A1300	Complex Analysis	M.Sc. (Tech.) 1-2	3	3
BM20A2600	Integral Transforms	B.Sc. (Tech.) 3	4	3
BM20A3500	Functional Analysis	M.Sc. (Tech.) 1-2	2	3

Elective Studies		*year*	*per.*	*ECTS cr*
BM20A1900	Statistics II	M.Sc. (Tech.) 1-2	2	3
BM20A2700	Numerical Analysis II	M.Sc. (Tech.) 1	3	3
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1-2	4	4
BM20A2900	Discrete Optimization	M.Sc. (Tech.) 1-2	4	4
BM20A3100	Fuzzy Sets and Fuzzy Logic	M.Sc. (Tech.) 1-2	2	4
BM20A3300	Stochastic Theory and Models	M.Sc. (Tech.) 1	4	3
BM20A3800	Advanced Mathematical Methods	M.Sc. (Tech.) 1	1-4	3-6

Minor Subject 20 ECTS cr
The minor subject will be selected from the minor subject modules available at other departments. There might be limitations regarding studies available in English. The minor subject selection should be discussed with the supervising professor or the MS programme coordinator in Technomathematics.

Elective Studies 14 ECTS cr
Elective courses may be chosen from various subjects. Also studies passed in other universities during exchange programmes can be accepted. The student should discuss the choice of elective courses with his/her supervisor.

Master's Thesis 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.

Contact Information
Programme Coordinator/Technomathematics:
Lecturer, Ph.D. Matti Heiliö (room 1343, firstname.lastname@lut.fi)

Technical Physics

Technical Physics is part of the two-year programme IMPEE for both international and Finnish students. Students majoring in Technical Physics should have a Bachelor's degree. The programme, leading to a Master of Science in Technology degree, is worth totally 120 credits including Master's Thesis of 30 credits. Depending on the degree and/or the level and extent of studies the student has obtained from his or her home university and based on his or her field of interest and specialization, for every admitted student will be composed an individual study programme. The application period for the programme is in January-February annually.

The aim of the major subject Technical Physics is to prepare the student professionally and academically in physics and other technical science skills in industry and other research and development tasks. The programme also provides the student with readiness for post-graduate studies and independent research.

Degree Structure		
General Studies	19	ECTS cr
Major Subject (inc. Master's Thesis)	70	ECTS cr
Minor Subject	20	ECTS cr
Elective Studies	11	ECTS cr
Total	*120 (min.)*	*ECTS cr*

General Studies 19 ECTS cr

Obligatory Studies (19 ECTS cr)		*year*	*per.*	*ECTS cr*
BM20A2100	Differential Equations	M.Sc. (Tech.) 1-2	3	4
BM20A2500	Linear Algebra and Normed Spaces	M.Sc. (Tech.) 1-2	1	3
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
BL10A5000	Basic Finnish course for Russian-speaking students	M.Sc. (Tech.) 1	1-2	2
CT10A9500	Research Methods	M.Sc. (Tech.) 1	1	3
FV11A9000	Academic Seminar for International Programs		2–4	6

Major Subject 70 ECTS cr

Obligatory Studies (62 ECTS cr)		*year*	*per.*	*ECTS cr*
BM30A0500	Applied Optics	M.Sc. (Tech.) 1	2	6
BM30A1100	Superconductor Physics	M.Sc. (Tech.) 1	1-2	6
BL30A0600	Power Electronics	M.Sc. (Tech.) 1	1-2	6
BL50A0600	Electromagnetic compatibility in power electronics	M.Sc. (Tech.) 1	1	2
BL60A0200	Microelectronics	M.Sc. (Tech.) 1	3	6
BL60A0400	Physics of Semiconductor Devices	M.Sc. (Tech.) 1-2		6
Thesis	Master's Thesis			30

Elective Studies		*year*	*per.*	*ECTS cr*
BM30A1000	Semiconductor Physics	M.Sc. (Tech.) 1	1-2	6
AB30A0300	International Finance and Emerging Markets	M.Sc. (Econ. & Bus. Adm.) 1	2	5
BL30A1200	Numerical Methods in Electromagnetism	M.Sc. (Tech.) 2	3	4
BL40A1900	Advanced Course in Electronics	M.Sc. (Tech.) 1	3-4	6
BL60A0500	CMOS Analog Circuit Design	M.Sc. (Tech.) 1-2		3-6

BL60A0600	Analog Circuit Design	M.Sc. (Tech.) 1-2		6
BL60A0700	Silicon VLSI Technology	M.Sc. (Tech.) 1-2		3-6
CS10A0050(*	Introduction to International Business	B.Sc. (Tech.) 2	4	4
CS10A0300	Business Forecasting	M.Sc. (Tech.) 1	1	4
CS10A0850	Transitional Countries Integration with the European Union - Trade, Manufacturing and Labour Perspective	M.Sc. (Tech.) 1	4	5

*) The course will be studied in the 4th year (M.Sc. (Tech.) 1).

Minor Subject 20 ECTS cr
The minor subject will be selected from the minor subject modules available at other departments. There might be limitations regarding studies available in English. The minor subject selection should be discussed with the supervising professor or the MS programme coordinator in Technical Physics.

Elective studies 11 ECTS cr
The student should discuss the choice of elective courses with his/her supervisor.

Master's Thesis 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 analyzis of the experimental results.

Contact Information
Programme Coordinator, Programme Content/Technical Physics:
Professor, Ph.D. Erkki Lähderanta (room 1372, firstname.lastname@lut.fi)

The Courses Offered in English

		ECTS cr
BM20A1300	Complex Analysis	3
BM20A1900	Statistics II	3
BM20A2000	Simulation	4
BM20A2100	Differential Equations	4
BM20A2200	Logic and Discrete Methods	4
BM20A2500	Linear Algebra and Normed Spaces	3
BM20A2600	Integral Transforms	3
BM20A2700	Numerical Analysis II	3
BM20A2800	Nonlinear Optimization	4
BM20A2900	Discrete Optimization	4
BM20A3000	Statistical Analysis in Modelling	4
BM20A3100	Fuzzy Sets and Fuzzy Logic	4
BM20A3200	Fuzzy Engineering	4
BM20A3300	Stochastic Theory and Models	3
BM20A3400	Design of Experiments	3
BM20A3500	Functional Analysis	3
BM20A3600	Fuzzy Data Analysis	4
BM20A3700	Fuzzy Decision Making	4
BM20A3800	Advanced Mathematical Methods	3 - 6
BM20A3900	Modelling Methodology in Process Engineering	6
BM20A4000	Case Study Seminar	5
BM30A0500	Applied Optics	6
BM30A1000	Semiconductor Physics	6
BM30A1100	Superconductor Physics	6

Course Descriptions

BM20A1300	***COMPLEX ANALYSIS***	***3 ECTS cr***
	Complex Analysis **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Pasi Luukka	
Aims	Give the students the necessary knowledge of complex analysis needed in technical applications.	
Contents	Complex number arithmetics and roots. Complex functions, also as mappings of complex plane. Derivative of a complex function and analytical functions. Complex integration, Cauchy's theorem and Residue theorem.	
Teaching Methods	Lectures 28 h, exercises 14 h, 3rd period. Exam.	
Assessment	0-5, examination 100 %.	
Course Material	Kreyszig, E.: Advanced Engineering Mathematics, 8th Ed., Part D.	
Prerequisites	Recommended Mathematics A and B.	

BM20A1900	***STATISTICS II***	***3 ECTS cr***
	Statistics II **The course will be lectured next time during the academic year 2007 - 2008.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 2	
Lecturer(s)	Lecturer, Ph.D. Matti Heiliö	

Aims	To give the students deeper understanding about statistical hypothesis testing, introduction to distributions of several variables, and multiple regression analysis.
Contents	Basic data analysis. Statistical inference: hypothesis testing. Nonparametric tests. Distributions of several variables. Correlation. Curve fitting and nonlinear regression. Multiple regression analysis. Elements of time series analysis and decision theory. Introduction to multivariate methods.
Teaching Methods	Lectures 28 h, exercises 14 h, assignment, 2nd period. Exam.
Assessment	0-5, examination 70 %, assignment 30 %.
Course Material	Will be announced on lectures.
Prerequisites	Recommended BM20A1400 Tilastomatematiikka I.

BM20A2000	***SIMULATION***	***4 ECTS cr***
	Simulation	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(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.	
Contents	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.	
Teaching Methods	Lectures 28 h, exercises 14 h, practical assignment, 1st period. Exam.	
Assessment	0-5, examination 100 %. Practical assignment.	
Prerequisites	Recommended BM20A1400 Tilastomatematiikka I.	

BM20A2100	***DIFFERENTIAL EQUATIONS***	***4 ECTS cr***
	Differential Equations **The course will be lectured next time during the academic year 2007 - 2008.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	
Lecturer(s)	Professor, Ph.D. Heikki Haario	
Aims	The course introduces the basic concepts of ordinary and partial differential equations together with numerical solution methods.	
Contents	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.	
Teaching Methods	Lectures 28 h, exercises 28 h, practical assignment, 3rd period. Exam.	
Assessment	0-5, examination 100 %. Practical assignment.	
Prerequisites	Mathematics A and B. Recommended BM20A1600 Matriisilaskenta, BM20A2700 Numerical Analysis II.	

BM20A2200	***LOGIC AND DISCRETE METHODS***	***4 ECTS cr***
	Logic and Discrete Methods	
Year and Period	M.Sc. (Tech.) 1, Period 4	
Lecturer(s)	Professor, Ph.D. Jorma Mattila	
Aims	To introduce essential methods of logic and discrete mathematics for computer science. A student can use these methods in formal environments of computer	

	science and related topics.
Contents	The course consists of classical logic and resolution method, inductive, recursional and relational methods for computer science. Graphs and trees, grammars, formal languages and parsing are included in the course. Resolution method for non-classical logics is considered. Applications of number theory to computer science are also considered.
Teaching Methods	Lectures 21 h, exercises 14 h, 4th period. Exam.
Assessment	0-5, examination 100 %.
Course Material	Grassmann, W.K., Tremblay J-P.: Logic and Discrete Mathematics. A Computer Science Perspective, Prentice Hall, 1996.

BM20A2500	***LINEAR ALGEBRA AND NORMED SPACES 3 ECTS cr***
	Linear Algebra and Normed Spaces **The course will be lectured next time during the academic year 2007 - 2008.**
Year and Period	M.Sc. (Tech.) 1-2, Period 1
Lecturer(s)	Lecturer, Ph.D. Matti Heiliö
Aims	Essentials of linear analysis in normed spaces and principles which are needed to understand methods of applied mathematics.
Contents	Vector spaces and linear operators. Linear subspaces and projection. Norms, metric and convergence. Function spaces. Banach spaces, Lp-spaces. Inner product and orthogonality. Hilbert spaces. Theory of matrices, eigenvalues and spectral decomposition. Applications in systems and signal analysis, numerical methods, optimization.
Teaching Methods	Lectures 21 h, exercises 14 h, 1st period. Exam.
Assessment	0-5, examination 100 %.
Course Material	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	BM20A1600 Matriisilaskenta. Recommended BM20A1200 Vektorikentät, BM20A2600 Integral Transforms.

BM20A2600	***INTEGRAL TRANSFORMS 3 ECTS cr***
	Integral Transforms
Year and Period	B.Sc. (Tech.) 3, Period 4
Lecturer(s)	Lecturer(s) responsible: Senior Assistant, D.Sc. (Tech.) Pasi Luukka
Aims	To show how different transform techniques are used in order to solve certain engineering problems.
Contents	Laplace transform, Fourier transform, z-transform. Examples of applications of transforms in engineering problem solving.
Teaching Methods	Lectures 28 h, exercises 14 h, 4th period. Exam.
Assessment	0-5, examination 100 %.
Course Material	Kreyszig, E.: Advanced Engineering Mathematics, Wiley, 1999. James, G.: Advanced Modern Engineering Mathematics, Addison-Wesley, 1993.
Prerequisites	Recommended Mathematics A and B.

BM20A2700	NUMERICAL ANALYSIS II	3 ECTS cr
	Numerical Analysis II	
Year and Period	M.Sc. (Tech.) 1, Period 3	
Lecturer(s)	Professor, Ph.D. Heikki Haario	
Aims	An introduction to methods of numerical integration and to solving ordinary and partial differential equations on a computer.	
Contents	Numerical differentiation, Numerical integration, Gaussian quadrature, Romberg integration. Numerical solution of ordinary differential equations, Runge-Kutta methods, stiffness and how to deal with it. Numerical solution of simple partial differential equations. Laplace equation, finite difference methods, finite element methods and related matrix computations.	
Teaching Methods	Lectures 21 h, exercises 14 h, 3rd period. Exam.	
Assessment	0-5, examination 100 %.	
Course Material	Will be announced at lectures.	
Prerequisites	Mathematics A and B. Recommended BM20A1500 Numeerinen analyysi I, BM20A1600 Matriisilaskenta.	

BM20A2800	NONLINEAR OPTIMIZATION	4 ECTS cr
	Nonlinear Optimization **The course will be lectured next time during the academic year 2007 - 2008.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Lecturer(s)	Lecturer, Lic.Phil. Sirkku Parviainen	
Aims	The course introduces the concepts of nonlinear optimization and provides the basic skills for formulating and solving nonlinear optimization tasks.	
Contents	Formulation of optimization models. Classification of optimization problems. Optimization of a function of one variable. Optimality criteria in unconstrained and constrained optimization. Line search methods, unconstrained multivariate optimization methods. Methods for constrained optimization. Methods for global optimization. Principles of evolutionary algorithms. Introduction to stochastic optimization. Optimization software tools, examples with Matlab.	
Teaching Methods	Self study based on literature. Exam.	
Assessment	0-5, examination 100 %.	
Course Material	Bazaraa, M. S., Sherali, H. S., Shetty, C. M.: Nonlinear Programming: Theory and Algorithms, Wiley, 2006. Rao, S. S.: Engineering Optimization: Theory and Practice, Wiley, 1996.	
Prerequisites	Mathematics A and B, BM20A1500 Numeerinen analyysi I. Experience in programming or using mathematical software required.	

BM20A2900	DISCRETE OPTIMIZATION	4 ECTS cr
	Discrete Optimization **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Lecturer(s)	Lecturer, Lic.Phil. Sirkku Parviainen	
Aims	To introduce the student to discrete or combinatorial optimization methods and problems.	
Contents	Discrete optimization problems. Algorithms and computational complexity. Polynomial-time problems and NP-complete problems. Integer linear	

	programming. Assignment problem. Traveling salesman problem: solution with branch&bound and heuristic methods. Routing and packing problems: solution with heuristics and dynamic programming. Principles of genetic algorithms and simulated annealing methods in discrete optimization.
Teaching Methods	Lectures 28 h, exercises 28 h, 4th period. Practical assignment. Exam.
Assessment	0-5, examination 100 %. Practical assignment.
Course Material	Will be announced on lectures.
Prerequisites	Experience in programming or using mathematical software required. Recommended BM20A1800 Lineaarinen optimointi.

BM20A3000	***STATISTICAL ANALYSIS IN MODELLING***	***4 ECTS cr***
	Statistical Analysis in Modelling	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Lecturer(s)	Professor, Ph.D. Heikki Haario	
Aims	Introduction to the methods of estimating reliability of modelling.	
Contents	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.	
Teaching Methods	Lectures 21 h, exercises 14 h, 2nd period. Practical assignment. Exam.	
Assessment	0-5, examination 100 %. Practical assignment.	
Prerequisites	Mathematics A and B, BM20A1400 Tilastomatematiikka I. Recommended BM20A2000 Simulation.	

BM20A3100	***FUZZY SETS AND FUZZY LOGIC***	***4 ECTS cr***
	Fuzzy Sets and Fuzzy Logic **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 2	
Lecturer(s)	Professor, Ph.D. Jorma Mattila	
Aims	To introduce mathematics of fuzzy systems. The student will learn the relations between crisp and fuzzy sets and those between algebras of crisp and fuzzy sets, some function algebras, lattices of membership functions and the basic things of L-sets. The student will learn also non-classical logics and some basic things of mathematical fuzzy logic basing on Lukasiewicz algebras.	
Contents	The course consists of concept of fuzziness, some algebras of fuzzy sets, fuzzy quantities, logical aspects of fuzzy sets, operations of fuzzy sets, relations, universal approximation, and fuzzy modelling and control.	
Teaching Methods	Lectures 28 h, exercises 14 h, 2nd period. Practical assignment. Exam.	
Assessment	0-5, examination 100 %. Practical assignment.	
Course Material	Nguyen, H.T., Walker, E.A.: A First Course in Fuzzy Logic, 2nd Ed., Chapman & Hall/CRC, 2000.	
Prerequisites	Recommended BM20A2300 Sumeat menetelmät.	

BM20A3200	***FUZZY ENGINEERING***	***4 ECTS cr***
	Fuzzy Engineering **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Lecturer(s)	Professor, Ph.D. Jorma Mattila	

Aims	To introduce fuzzy systems in engineering environment. The student will learn function approximation methods with fuzzy systems and how to model and solve control problems and learn some image processing methods. Finally, fuzzy cognitive maps are introduced.
Contents	Fuzzy sets and relations. Fuzzy functions and rule-based systems. Mamdani fuzzy system and Sugeno-Tagaki fuzzy system. Universal approximator theorem. Fuzzy control. Fuzzy controllers in applications. Some image processing techniques. Fuzzy cognitive maps with applications.
Teaching Methods	Lectures 28 h, exercises 14 h, 4th period. Practical assignment. Exam.
Assessment	0-5, examination 100 %. Practical assignment.
Course Material	Bandemer, H., Näther, W.: Fuzzy Data Analysis, Kluwer Academic Publ., 1992. Kosko, B: Fuzzy Engineering, Prentice-Hall, 1996. Passino, K.M., Yurkovich, S.: Fuzzy Control, Addison-Wesley, 1998.
Prerequisites	Recommended BM20A2300 Sumeat menetelmät, BM20A3100 Fuzzy Sets and Fuzzy Logic.

BM20A3300	***STOCHASTIC THEORY AND MODELS***	***3 ECTS cr***
	Stochastic Theory and Models	
Year and Period	M.Sc. (Tech.) 1, Period 4	
Lecturer(s)	Lecturer, Ph.D. Matti Heiliö	
Aims	To present theory of stochastics and advanced statistical methods for understanding systems and phenomena containing randomness and uncertainty.	
Contents	Theory of stochastics applicable to modelling and analysing systems where randomness is inherent in a non-trivial way. Stochastic processes, conditional expectations and martingales. Brownian motion, introduction to Ito-integral and stochastic differential equations. Time series and ARMA-models. Regression and linear statistical models. Analysis and identification of nonlinear statistical models. Bayesian and MCMC methods.	
Teaching Methods	Virtual course. Lectures (web) 14 h, exercises 12 h, project assignment, 4th period. Self-study material. Exam.	
Assessment	0-5, examination 50 %, project assignment 50 %.	
Course Material	Will be announced at lectures.	
Prerequisites	BM20A1400 Tilastomatematiikka I. Recommended BM20A1900 Statistics II, BM20A2500 Linear Algebra and Normed Spaces.	

BM20A3400	***DESIGN OF EXPERIMENTS***	***3 ECTS cr***
	Design of Experiments **The course will be lectured next time during the academic year 2007 - 2008.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 4	
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Pasi Luukka	
Aims	Introduction to the basic concepts for efficient planning of experiments.	
Contents	Importance of experimental design, minimization of prediction uncertainty. Basic factorial designs: 2N, Central Composite designs for regression analysis. Variance analysis for qualitative factors. The Taguchi principles. Experimental optimisation of engineering processes.	
Teaching Methods	Lectures 28 h, exercises 28 h, practical assignment, 4th period. Exam.	
Assessment	0-5, examination 100 %.	
Prerequisites	Mathematics A and B, BM20A1400 Tilastomatematiikka I. Recommended BM20A1600 Matriisilaskenta.	

BM20A3500	*FUNCTIONAL ANALYSIS*	*3 ECTS cr*
	Functional Analysis **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 2	
Lecturer(s)	Lecturer, Ph.D. Matti Heiliö	
Aims	Principles of functional analysis giving a basis for understanding modern theory and methods in applied mathematics.	
Contents	Hilbert spaces and Banach spaces. Measures and Lebesgue integral, Lp-spaces. Basics of calculus of variations and optimal control. Integral transforms. Elements of wavelet theory and linear systems theory. Sobolev norms, variational principle and weak solutions of PDE:s. Introduction to stochastic differential equations.	
Teaching Methods	Lectures 21 h, exercises 14 h, 2nd period. Exam.	
Assessment	0-5, examination 100 %.	
Course Material	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. Curtain, R.F., Pritchard, A.J.: Functional analysis in modern applied mathematics, Academic Press, 1977. Rao, R.M., Bopardikar, A.S.: Wavelet transforms, Introduction to theory and applications, Addison-Wesley, 1998.	
Prerequisites	BM20A2500 Linear Algebra and Normed Spaces. Recommended BM20A1300 Complex Analysis, BM20A1500 Numeerinen analyysi I, BM20A2600 Integral Transforms.	

BM20A3600	*FUZZY DATA ANALYSIS*	*4 ECTS cr*
	Fuzzy Data Analysis **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 3	
Lecturer(s)	Senior Assistant, D.Sc. (Tech.) Pasi Luukka	
Aims	To introduce theoretical aspects of data analysis. The student will learn how to model and analyze uncertainty in different problem settings.	
Contents	Fuzzy sets and relations. Uncertainty measures. Qualitative and quantitative analysis of fuzzy data. Introduction to possibility theory and generalized measure theory. Evaluation of methods.	
Teaching Methods	Lectures 28 h, exercises 14 h, 3rd period. Practical assignment. Exam.	
Assessment	0-5, examination 100 %. Practical assignment.	
Course Material	Bandemer, H., Näther, W.: Fuzzy Data Analysis, Kluwer Academic Publ., 1992.	
Prerequisites	Recommended BM20A2300 Sumeat menetelmät, BM20A3100 Fuzzy Sets and Fuzzy Logic.	

BM20A3700	*FUZZY DECISION MAKING*	*4 ECTS cr*
	Fuzzy Decision Making **The course will be lectured next time during the academic year 2007 - 2008.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 2	
Lecturer(s)	Professor, Ph.D. Jorma Mattila	

Aims	To introduce decision making in a fuzzy environment. The student will learn approximate reasoning, fuzzy neural networks, fuzzy clustering, fuzzy screening systems and some perspectives on fuzzy decision making.
Contents	The central methods of fuzzy inference and decision making.
Teaching Methods	Lectures 28 h, exercises 14 h, 2nd period. Practical assignment. Exam.
Assessment	0-5, examination 100 %. Practical assignment.
Course Material	Fullér, R.: Introduction to Neuro-Fuzzy Systems, Physica-Verlag, 2000.
Prerequisites	Recommended BM20A2300 Sumeat menetelmät, BM20A3100 Fuzzy Sets and Fuzzy Logic.

BM20A3800	***ADVANCED MATHEMATICAL METHODS***	***3 - 6 ECTS cr***
	Advanced Mathematical Methods	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Lecturer(s)	Lecturer, Ph.D. Matti Heiliö	
Aims	Student will obtain theoretical and operational skills in some specific area of applied mathematics.	
Contents	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 etc. The course with the same title can be included in the study programme twice when two distinct areas are covered.	
Teaching Methods	Self study material, exam and/or report.	
Assessment	0-5, examination and/or report 100 %.	
Prerequisites	Recommended BM20A1200 Vektorikentät, BM20A1500 Numeerinen analyysi I, BM20A1600 Matriisilaskenta.	

BM20A3900	***MODELLING METHODOLOGY IN PROCESS ENGINEERING***	***6 ECTS cr***
	Modelling Methodology in Process Engineering	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Researcher/Teacher, Ph.D. Tuomo Kauranne	
Aims	The course provides an overview to the concepts and techniques of mathematical modelling in process engineering.	
Contents	Types of modelling: empirical and physicochemical models and the use of them. Measurement of uncertainty in experimental data. Basic concepts of regression methods for empirical models. Building physicochemical models for engineering processes from first principles. How to employ various mathematical tools to formulate and numerically solve models. Least squares methods, curve fitting and parameter estimation. Examples from data analysis, process modelling, pulp and paper technology, chemical engineering, and signal processing among others. Examples and exercises with Matlab.	
Teaching Methods	Lectures 21 h, exercises 14 h, 1st period. Lectures 21 h, exercises 14 h, 2nd period. Practical assignment. Exam.	
Assessment	0-5, examination 100 %. Practical assignment.	
Course Material	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 BM20A1400 Tilastomatematiikka I, BM20A1500 Numeerinen analyysi I, BM20A1600 Matriisilaskenta, BM20A2100 Differential Equations.	

BM20A4000	CASE STUDY SEMINAR	5 ECTS cr
	Case Study Seminar	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Lecturer(s)	Professor, Ph.D. Heikki Haario	
Aims	The course gives an introduction to independent scientific work by presenting seminar works from different fields of applied mathematics.	
Contents	The course works in a seminar form. Each student receives a project work topic and presents the problem as well as the work plan in the beginning. Typically, the topics cover modelling problems from different engineering fields, together with numerical solutions. Solution methods for the project work problems are discussed during the course. At conclusion, the participants present their project works.	
Teaching Methods	Exercises 14 h, 1st period. Exercises 14 h, 2nd period. Exercises 14 h, 3rd period. Exercises 14 h, 4th period. Extended project work. Seminar is held in each period.	
Assessment	Pass/fail. To pass the course student must attend 7 weeks and present his/her project work.	
Prerequisites	Mathematics A and B. Recommended BM20A1500 Numeerinen analyysi I, BM20A1600 Matriisilaskenta, BM20A3900 Modelling Methodology in Process Engineering.	

BM30A0500	APPLIED OPTICS	6 ECTS cr
	Applied Optics	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Lecturer(s)	Lecturer, Ph.D. Pertti Silfsten	
Aims	The aims of the course are to describe basic optical phenomena and their applications particularly in the field of optical measurement technology and to provide the students with the skills to understand the operation of optical measurement instruments.	
Contents	Ocular optics. Colour optics. Optical measurement instruments. Interferometry. Polarisation. Diffraction. Fourier optics. The optical properties of materials.	
Teaching Methods	Lectures 42 h, tutorials 28 h, 2nd period. Written examination.	
Assessment	0-5, examination 100 %.	
Course Material	Pertti Silfsten: Sovellettu optiikka.	
Prerequisites	Students are recommended to have completed Physics or Physics L.	

BM30A1000	SEMICONDUCTOR PHYSICS	6 ECTS cr
	Semiconductor Physics	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Professor, Ph.D. Erkki Lähderanta	
Aims	The course gives the student the skills to understand the behaviour of semiconductors. This understanding is based on the comprehension of the electron dynamics and the energy band.	
Contents	A basic knowledge of the phenomena governing the operation of semiconductors, starting from the basis of material physics.	
Teaching Methods	Lectures 28 h, tutorials 14 h, 1st period. Lectures 14 h, tutorials 14 h, 2nd period. Written examination.	
Assessment	0-5, examination 100 %.	
Course Material	Juha Sinkkonen: Puolijohdeteknologian perusteet.	
Prerequisites	A knowledge of the fundamentals of material physics, a knowledge of the electric and physical properties of materials.	

BM30A1100	*SUPERCONDUCTOR PHYSICS*	*6 ECTS cr*
	Superconductor Physics	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Professor, Ph.D. Erkki Lähderanta	
Aims	The course gives the student the skills to understand the behaviour of superconductors. The student is acquainted with different properties of superconductors.	
Contents	A basic knowledge of the physical behaviour of superconductors, starting from the basis of material physics.	
Teaching Methods	Lectures 14 h, tutorials 14 h, 1st period. Lectures 28 h, tutorials 14 h, 2nd period. Written examination.	
Assessment	0-5, examination 100 %.	
Course Material	A.C. Rose-Innes and E.H. Rhoderick: Introduction to Superconductivity, second edition (Pergamon).	
Prerequisites	A knowledge of the fundamentals of material physics, a knowledge of the electric and physical properties of materials.	

7 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.

Objectives 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 postgraduate 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 either 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
Teacher responsible: Professor 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
Teacher responsible: Professor 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
Credits	*120 (min.)*	*ECTS cr*

General Studies (obligatory)

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.

Communication Skills (9 ECTS cr)		*year*	*per.*	*ECTS cr*
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

*) The course FV13A1200 Teknisk svenska is obligatory for Finnish students who have not attained proficiency in Swedish in their previous degree.

Major Subject (70 ECTS cr)

Sustainable Process Engineering

Obligatory Studies (62 ECTS cr)		*year*	*per.*	*ECTS cr*
BJ20A0500	Chemical Engineering Unit Operations II	M.Sc. (Tech.) 1	1	4
BJ20A0600	Chemical Engineering Unit Operations III	M.Sc. (Tech.) 1	2	4
BJ30A0500	Project on Process and Plant Design	M.Sc. (Tech.) 2	1-2	11
BJ40A0100	Product Design	M.Sc. (Tech.) 1	4	5
BJ90A0700	Chemical Separation Methods	M.Sc. (Tech.) 1	3-4	8
Thesis	Master's Thesis			30

Min. 8 ECTS credits should be selected to attain 70 ECTS credits.

List of Selectable Courses		*year*	*per.*	*ECTS cr*
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
BJ20A1000	Advanced Course in Environmental Technology	M.Sc. (Tech.) 1	3-4	6
BJ20A1100	Filtration and Mixing	M.Sc. (Tech.) 1	3-4	6
BJ60F0100	Chemical Pulping Technology: Chemical Recovery	M.Sc. (Tech.) 1	1-2	4
BJ60F0200	Chemical Pulping Technology: Fiberline Operations	M.Sc. (Tech.) 1	3-4	6
BJ60F0300	Fiber Technology; Personal Assignment		1-4	6
BJ80A0300	Transport Phenomena	M.Sc. (Tech.) 1	2	3

*) The course will be studied in the 4th year (M.Sc. (Tech.) 1).

Minor Subject (20 ECTS cr)

Advanced Design Methodology

Min. 20 ECTS credits should be selected		*year*	*per.*	*ECTS cr*
BJ10A0300	Dynamics and Control of Chemical Processes	M.Sc. (Tech.) 2	1-2	4
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	M.Sc. (Tech.) 2	2	6
BJ30A1200	Process Intensification	M.Sc. (Tech.) 1	2	2
BJ30A1300	Process Simulation	M.Sc. (Tech.) 1	3-4	6
BJ40A0000	Creative Design	M.Sc. (Tech.) 1	1	3
BM20A3900	Modelling Methodology in Process Engineering	M.Sc. (Tech.) 1	1-2	6

Elective Studies
Elective studies are needed to attain the full 120 ECTS credits. All the courses included in the IPPE-programme support the objectives of the programme. Consequently, it is recommended that students would choose their elective studies among the courses that are listed under selectable courses in the major subject. However, elective studies can include any courses offered by Lappeenranta University of Technology.

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.
Further information: Study Coordinator Piia Vahvanen (room 2355, piia.vahvanen@lut.fi).

Complementary Studies (21–60 ECTS cr)
Students with a Finnish polytechnic degree (or equivalent) will have to study complementary studies. The extent of these studies depends on the content of the previous degree.
Further information: senior assistant Harri Niemi (room 2120, harri.niemi@lut.fi).

Contact Information
Programme Coordinator:
Professor, Ph.D. Andrzej Kraslawski (room 2362, andrzej.kraslawski@lut.fi)
Study Coordinator:
Piia Vahvanen (room 2355, piia.vahvanen@lut.fi)

Programme web pages: www.lut.fi/ippe

The Courses Offered in English

		ECTS cr
BJ10A0000	Laboratory Work Course in Chemical Technology	10 - 20
BJ10A0300	Dynamics and Control of Chemical Processes	4
BJ10A0400	Process Control Systems in Pulp and Paper Industry	3
BJ10A0500	Cross-Cultural Communication for Working Life	2
BJ20A0500	Chemical Engineering Unit Operations II	4
BJ20A0600	Chemical Engineering Unit Operations III	4
BJ20A0800	Treatment Processes of Industrial Discharges	5
BJ20A1000	Advanced Course in Environmental Technology	6
BJ20A1100	Filtration and Mixing	6
BJ30A0500	Project on Process and Plant Design	11
BJ30A0700	Computational Fluid Dynamics in Chemical Engineering	6
BJ30A1200	Process Intensification	2
BJ30A1300	Process Simulation	6
BJ30A1400	Process and Product Innovations	12
BJ40A0000	Creative Design	3
BJ40A0100	Product Design	5
BJ50A0400	Advanced Course in Membrane Technology and Technical Polymer Chemistry	10
BJ50A0500	Synthetic Polymers: Glues and Resins	5
BJ50A0600	Protein Chemistry and Microbiology	4
BJ60F0100	Chemical Pulping Technology: Chemical Recovery	4
BJ60F0200	Chemical Pulping Technology: Fiberline Operations	6
BJ60F0300	Fiber Technology; Personal Assignment	6
BJ80A0300	Transport Phenomena	3
BJ80A0800	Properties of Gases and Liquids	5
BJ90A0400	Catalysis	4
BJ90A0600	Industrial Biotechnology	2
BJ90A0700	Chemical Separation Methods	4 - 8
BJ90A0800	Nutritional and Food Biotechnology	3

Course Descriptions

BJ10A0000	***LABORATORY WORK COURSE IN CHEMICAL TECHNOLOGY***	***10 - 20 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.**	
Lecturer(s)	N. N. Lecturer(s) responsible: Head of the Laboratory	
Aims	To give the student a deeper understanding on chemical technology in a specialized area.	
Contents	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.	
Teaching Methods	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.	
Assessment	Pass/Fail.	
Course Material	Literature related to the project.	

BJ10A0300	***DYNAMICS AND CONTROL OF CHEMICAL PROCESSES*** ***4 ECTS cr***
	Dynamics and Control of Chemical Processes
Year and Period	M.Sc. (Tech.) 2, Period 1-2
Lecturer(s)	Docent, D.Sc. (Tech.) Leif Hammarström Assistant, N. N. Professor, Ph.D. Andrzej Kraslawski (contact person)
Contents	Motivation for process control. Repetition of properties of simple dynamic elements and controllers. Properties of typical process units. Behaviour of processes: simple elements and multi-input multi-output units with interaction. Analysis of process behaviour: experiments, modelling, simulation, stability assessment, and evaluation of control variable and disturbance effects. Process control requirements in different process or unit types with consideration of control possibilities and constraints. Control strategies: specifying controller configurations with respect to production needs such as stability, functionality, operability, safety, and quality. Review of advanced control concepts including multivariable control, prediction, estimation, and optimization.
Teaching Methods	Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h, exercises 14 h, 2nd period. Project work.
Assessment	0-5, written examination 100 %.
Course Material	To be specified later. Matlab-Simulink simulation environment, Process Control, System Identification and Fuzzy Control toolboxes, Mathworks 1984 - 2004.

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
Lecturer(s)	Lic.Sc. (Tech.) Merja Mäkelä Professor, Ph.D. Andrzej Kraslawski (contact person)
Contents	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.
Teaching Methods	Lectures 16 h, 1st period. Lectures 12 h, 2nd period. Individual or team project work with supervision 12 h, 2nd period.
Assessment	0-5, written examination 60 %, project work 40 %.
Course Material	Learning Environment for Papermaking and Automation, KnowPap, Licentia 2004, Espoo Finland. Learning Environment for Chemical Pulping and Automation, KnowPulp, Licentia 2004, Espoo Finland. Matlab-Simulink simulation environment, Process Control, System Identification and Fuzzy Control toolboxes, Mathworks 1984 - 2004. Leiviskä, K., Process control, Book 14, in Papermaking Science and Technology, Fapet, 1999, 297 p., ISBN 952-5216-00-4. Sell, Nancy J., Process Control Fundamentals for the Pulp and Paper Industry, Tappi, 1995, Atlanta, USA, 612 p., ISBN 0-89852-294-3.

BJ10A0500	*CROSS-CULTURAL COMMUNICATION FOR WORKING LIFE* *2 ECTS cr*
	Cross-Cultural Communication for Working Life
Year and Period	M.Sc. (Tech.) 1, Period 3
Lecturer(s)	M.Sc. (Tech.) Mark Middleton Professor, Ph.D. Andrzej Kraslawski (contact person)
Aims	To provide students knowledge about problems arising in industrial working environments due to ineffective communication.
Contents	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.
Teaching Methods	Intensive course. Lectures 16 h, exercises 16 h, 3rd period. No examination. The number of participants is limited. Priority is given to the students of the Master's Degree Programme in Chemical and Process Engineering (IPPE).
Assessment	Pass/Fail. Active participation in lectures and exercises.

BJ20A0500	*CHEMICAL ENGINEERING UNIT OPERATIONS II* *4 ECTS cr*
	Chemical Engineering Unit Operations II
Year and Period	M.Sc. (Tech.) 1, Period 1
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Kallas Senior Assistant, D.Sc. (Tech.) Harri Niemi
Aims	To familiarize students with separation techniques and the theory of mass transfer more extensively than in the courses BJ20A0400 Kemiantekniikan yksikköoperaatiot I A and BJ20A0450 Kemiantekniikan yksikköoperaatiot I B.
Contents	The topics are as follows: 1. Membrane separation: Mass transfer, modelling, process design, simulation of industrial membrane processes. 2. Adsorption: theory, equipment, applications in industry and purification of polluted water and air.
Teaching Methods	Lectures 12 h, exercises 28 h, 1st period.
Assessment	0-5, written examination 100 %.
Course Material	Lecture notes.
Prerequisites	BJ20A0400 Kemiantekniikan yksikköoperaatiot I A and BJ80A0100 Johdanto kemialliseen termodynamiikkaan passed.

BJ20A0600	*CHEMICAL ENGINEERING UNIT OPERATIONS III* *4 ECTS cr*
	Chemical Engineering Unit Operations III
Year and Period	M.Sc. (Tech.) 1, Period 2
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Kallas Docent, D.Sc. (Tech.) Marjatta Louhi-Kultanen
Aims	To familiarize students with separation techniques and the theory of mass transfer more extensively than in the courses BJ20A0400 Kemiantekniikan yksikköoperaatiot I A and BJ20A0450 Kemiantekniikan yksikköoperaatiot I B.
Contents	The topics are as follows: 1. Industrial crystallization: theory, operation and design of crystallizers, and the basics of precipitation. 2. 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.
Teaching Methods	Lectures 12 h, exercises 28 h, 2nd period. Laboratory work and reports.
Assessment	0-5, written examination 100 %, reports passed.
Course Material	Davey, R.J., Garside, J., From molecules to crystallizers, Oxford: Oxford University Press, 2000. Lecture notes.
Prerequisites	BJ20A0400 Kemiantekniikan yksikköoperaatiot I A and BJ80A0100 Johdanto kemialliseen termodynamiikkaan passed.

BJ20A0800	***TREATMENT PROCESSES OF INDUSTRIAL DISCHARGES*** ***5 ECTS cr***
	Treatment Processes of Industrial Discharges
Year and Period	B.Sc. (Tech.) 3, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Kallas Docent, Ph.D. Sergei Preis
Aims	To familiarize students with engineering solutions of environmental problems concerning water and wastewater treatment, air emissions control and solid waste processing and disposal.
Contents	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.
Teaching Methods	Lectures and exercises 21 h, 3rd period. Lectures and exercises 21 h, 4th period.
Assessment	0-5, written examination 100 %.
Course Material	Peavy, H.S., Rowe, D.R., Tchobanoglous, G., Environmental Engineering, McGraw-Hill, 1st ed., 1985.
Prerequisites	Recommended BJ20A0000 Nesteiden, kaasujen ja kiintoaineiden käsittely, BJ20A0100 Mekaaniset erotusmenetelmät and BJ20A0400 Kemiantekniikan yksikköoperaatiot I A part 2 attended.

BJ20A1000	***ADVANCED COURSE IN ENVIRONMENTAL TECHNOLOGY*** ***6 ECTS cr***
	Advanced Course in Environmental Technology
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Kallas Professor (Tallin University of Technology), D.Sc. (Tech.) Rein Munter
Contents	"Green chemistry" in technology and in treatment of industrial and municipal wastes. Reducing of water demand: closing of water cycles in industry.
Teaching Methods	Lectures 6 h, exercises 8 h, 3rd period. Lectures 6 h, exercises and seminars 16 h, 4th period. Literature work, report and seminar presentation.
Assessment	0-5, written examination 50 %, report and seminar 50 %.
Course Material	Lecture notes.

BJ20A1100	***FILTRATION AND MIXING*** ***6 ECTS cr***
	Filtration and Mixing
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Lecturer, D.Sc. (Tech.) Ritva Tuunila

	Docent, D.Sc. (Tech.) Tuomas Koiranen Docent, D.Sc. (Tech.) Marjatta Louhi-Kultanen
Aims	To familiarize students with solid-liquid separation techniques and mixing processes.
Contents	The topics are as follows: Filtration: fundamentals of filtration, filtration methods, operation of filters, cake formation and washing, deliquoring, design and modeling of filters. Mixing: fundamentals of mixing, rheology, mixing equipment, design of mixers and scale-up.
Teaching Methods	Lectures 14 h, exercises 14 h, 3rd period. Lectures 14 h, exercises 14 h, 4th period. Laboratory work and reports.
Assessment	0-5, written examination 100 %, reports passed.
Course Material	Additional material will be informed at lectures.
Prerequisites	BJ20A0100 Mekaaniset erotusmenetelmät passed.

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
Lecturer(s)	Professor, D.Sc. (Tech.) Ilkka Turunen
Aims	The purpose is to make students familiar with process and plant design with the help of an extensive project work.
Contents	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), lay-out, cost and profitability estimation. Different aspects are emphasized in different projects, depending on the topic. Suitable also for post-graduate studies.
Teaching Methods	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.
Assessment	0-5, design reports 100 %.
Prerequisites	BJ20A0000 Nesteiden, kaasujen ja kiintoaineiden käsittely BJ30A0100 Ideasta tuotantoon: 1. Tuotekehitys BJ30A0200 Ideasta tuotantoon: 2. Prosessitutkimus ja -kehitys BJ30A0300 Ideasta tuotantoon: 3. Prosessi- ja tehdassuunnittelu

BJ30A0700	***COMPUTATIONAL FLUID DYNAMICS IN CHEMICAL ENGINEERING 6 ECTS cr***
	Computational Fluid Dynamics in Chemical Engineering
Year and Period	M.Sc. (Tech.) 2, Period 2
Lecturer(s)	Docent, D.Sc. (Tech.) Zuoliang Sha Assistant, N. N. Lecturer(s) responsible: Professor, D.Sc. (Tech.) Ilkka Turunen
Aims	To teach students to use CFD to solve chemical engineering problems, e.g. in equipment design and trouble shooting.
Contents	Theoretical basis of CFD. Introduction of CFX software. Applications of CFD in process industry. Solving chemical engineering problems with CFD.
Teaching Methods	Lectures 28 h, 2nd period. Exercises with CFD software 120 h, 2nd period. Seminar presentation. No examination.

Assessment	0-5, seminar presentation 70 %, exercise report 30 %. At least 90 % presence at lectures required.
Course Material	To be announced later.

BJ30A1200	***PROCESS INTENSIFICATION***	***2 ECTS cr***
	Process Intensification	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Lecturer(s)	Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	To make students familiar with the methods and latest achievements of process intensification.	
Contents	Definitions of process intensification. Intensification of chemical reactors. Intensification of separation processes. Microprocess technology. Methodology of process intensification.	
Teaching Methods	Lectures 21 h, exercises arranged as brainstorming sessions 9 h, 2nd period.	
Assessment	0-5, written examination 100 %.	

BJ30A1300	***PROCESS SIMULATION***	***6 ECTS cr***
	Process Simulation	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	N. N. Lecturer(s) responsible: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	To make students familiar with process simulation as a tool in development, design and operation in chemical and pulp and paper industry.	
Contents	Basics of process simulation. Steady-state and dynamic simulation. Introduction to ASPEN and BALAS-software. Examples of industrial simulation cases for process design. Suitable also for post-graduate studies.	
Teaching Methods	Intensive course. Lectures 28 h, 3rd and/or 4th period. Simulation exercises as guided individual assignments.	
Assessment	0-5, written examination 100 %.	
Prerequisites	BJ20A0300 Prosessisimuloinnin perusteet.	

BJ30A1400	***PROCESS AND PRODUCT INNOVATIONS***	***12 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 students will be selected on a basis of applications.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4,1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Tuomo Kässi Professor, D.Sc. (Tech.) Olli Pyrhönen Researcher/Teacher, D.Sc. (Tech.) Ville Ojanen Researcher/Teacher, D.Sc. (Tech.) Kimmo Kerkkänen Researcher/Teacher, D.Sc. (Tech.) Riku Pöllänen Lecturer(s) responsible: Professor, D.Sc. (Tech.) Ilkka Turunen	
Aims	To get acquainted with the generation of innovations and new technology, the typical methods, problems and their solutions. To train project and teamwork in interdisciplinary, international environment. To get acquainted with product and process development. To train and deepen many skills learned in other connections.	
Contents	Methods of product and process development. Interdisciplinary R & D activities as project and teamwork. Development of new technology, patenting. Suitable also for post-graduate studies.	

Teaching Methods	Informational lectures, 6 h/period. Project meetings, 6 h/period. Independent project and teamwork in groups of 4-8 students approximately 300 h/student.
Assessment	0-5, project work 100 %.

BJ40A0000	***CREATIVE DESIGN***	***3 ECTS cr***
	Creative Design	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, Ph.D. Andrzej Kraslawski	
Contents	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).	
Teaching Methods	Lectures and exercises 56 h, 1st period.	
Assessment	0-5, written examination 50 %, exercises and presence at the lectures 50 %.	
Course Material	Lecture notes.	

BJ40A0100	***PRODUCT DESIGN***	***5 ECTS cr***
	Product Design	
Year and Period	M.Sc. (Tech.) 1, Period 4	
Lecturer(s)	Professor, Ph.D. Andrzej Kraslawski	
Contents	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.	
Teaching Methods	Lectures 15 h, exercises 20 h, 4th period.	
Assessment	0-5, written examination 50 %, exercises and presence at the lectures 50 %.	
Course Material	Lecture notes.	

BJ50A0400	***ADVANCED COURSE IN MEMBRANE TECHNOLOGY AND TECHNICAL POLYMER CHEMISTRY***	***10 ECTS cr***
	Membraanitekniikan ja teknillisen polymeerikemian syventävä opintojakso **The course will be given in English if required.**	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	Professor, Ph.D. Marianne Nyström	
Aims	Advanced studies in membrane technology, technical polymer chemistry and pulp and paper technology.	
Contents	Refining of polymeric materials, polymerisation and characterisation of polymers using different methods. Membrane processes.	
Teaching Methods	Lectures and seminars 21 h, 1st period. Lectures and seminars 21 h, 2nd period. Personal research project 165 h, 1st–2nd period. Lectures, laboratory work, seminar lectures and possibly a test. Obligatory seminars.	
Assessment	0-5, personal laboratory research work 40%, seminars 60%.	

BJ50A0500	SYNTHETIC POLYMERS: GLUES AND RESINS 5 ECTS cr
	Synteettiset polymeerit: Liimat ja hartsit **The course will be given in English if required. The course will be arranged together with the Department of Mechanical Engineering. The course will be lectured next time during the academic year 2008 - 2009.**
Year and Period	M.Sc. (Tech.) 1-2, Period 1-2
Lecturer(s)	Professor, Ph.D. Marianne Nyström Professor, D.Sc. (Tech.) Ilkka Pöyhönen N.N. Guest lecturers
Aims	Advanced studies in synthetic polymer chemistry, characterisation of polymer materials and their behaviour in industrial applications.
Contents	Production of resins and glues and their use in industry, especially in the pulp and paper industry. Production of synthetic polymers. Homopolymers, co-polymers and cross-linking. Chemical reactions of polymers and analysis methods. Industrial uses of polymers. Resins and glues. Suitable also for postgraduate studies.
Teaching Methods	Intensive course. Lectures 35 h and a seminar report, 1st and/or 2nd period. Obligatory seminar and laboratory work, industrial visit.
Assessment	0-5, written examination 100%.

BJ50A0600	PROTEIN CHEMISTRY AND MICROBIOLOGY 4 ECTS cr
	Proteiinien kemia ja mikrobiologia **The course will be lectured for the last time during the academic year 2007-2008. The course will be given in English, if required.**
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Professor, Ph.D. Marianne Nyström D.Sc. (Tech.) Svetlana Butylina Docent, Ph.D. Sinikka Parkkinen Part-time Untenured Teacher, N. N. Guest lecturers
Aims	Advanced knowledge on protein and polyelectrolyte chemistry. The course also gives information on the utilisation of proteins, and presents the fundamentals on microbiology, especially on food technology.
Contents	Structure and chemical reactions of proteins. Separation and fractionation of proteins using membrane filtration and chromatografical methods. Important proteins in food technology. Classification of microbes, their chemistry, analysis and cultivation methods. Suitable also for postgraduate studies.
Teaching Methods	Lectures 28 h, laboratory work 40 h, 3rd and/or 4th period. Obligatory lectures (80%) and laboratory work.
Assessment	0-5, written examination 100%.

BJ60F0100	CHEMICAL PULPING TECHNOLOGY: CHEMICAL RECOVERY 4 ECTS cr
	Chemical Pulping Technology: Chemical Recovery
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Professor, M.Sc. (Tech.) Kaj Henricson Assistant, M.Sc. (Tech.) Katriina Kolhonen
Aims	To familiarize the students with the process and equipment technology used in the recovery of cooking chemicals and the manufacturing of bleaching chemicals. To develop understanding of mill emissions, energy and mass balances.
Contents	Chemical recovery and mill systems. Evaporation and combustion of black

	liquor. Handling of green liquor and non-process elements. White liquor preparation. Manufacturing of bleaching chemicals. Alternative cooking methods. Dimensioning of mill equipment. Mill emissions related to the manufacture of chemical pulp.
Teaching Methods	Lectures, exercises and seminars 14 h, 1st period. Lectures, exercises and seminars 14 h, 2nd period. Blackboard-support. Lectures, personal assignment and seminars.
Assessment	0-5, written examination 75 %, personal assignment 25 %.
Course Material	Gullichsen, J., Paulapuro, H. (eds), Papermaking Science and Technology, Fapet Oy, vol. 1 (1998), vol. 3 (1999), vol. 6A (2000), vol. 6B (2000) specified sections. Adams, Terry N. et. al., Kraft Recovery Boilers, Tappi Press (1997) specified sections. Vakkilainen, Esa K.: Kraft recovery boilers: principles and practice, Suomen Soodakattilayhdistys, 2005 (specified sections). Blackboard course material, handouts and other specified reading.
Prerequisites	BJ60F0000 Selluloosatekniikan perusteet attended or corresponding knowledge of forest industry.

BJ60F0200	***CHEMICAL PULPING TECHNOLOGY: FIBERLINE OPERATIONS*** ***6 ECTS cr***
	Chemical Pulping Technology: Fiberline Operations
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Professor, M.Sc. (Tech.) Kaj Henricson Lecturer, N. N.
Aims	To familiarize the students with the process and equipment technology used in the manufacture of chemical pulp with special focus on cooking systems, bleaching, washing, screening and mill emissions related to fiberline operations.
Contents	Cooking, oxygen delignification, screening, and bleaching. Machinery used in the fiberline with special focus on the sulfate process. Handling of high consistency fiber suspensions. Comparing and choosing bleaching sequences. Bleaching chemicals and the manufacture of bleached chemical pulp. Mill emissions related to the manufacture of chemical pulp.
Teaching Methods	Lectures, exercises and seminars 21 h, 3rd period. Lectures, exercises and seminars 21 h, 4th period. Blackboard-support. Lectures, personal assignments and seminars.
Assessment	0-5, written examination 65 %, personal assignments 35 %.
Course Material	Gullichsen, J., Paulapuro, H. (eds), Papermaking Science and Technology, Fapet Oy, vol. 1 (1998), vol. 3 (1999), vol. 6A (2000), vol. 6B (2000) specified sections. Dence, C., Reeve, D. (eds), Pulp Bleaching - Principles and Practice, Tappi Press (1996) specified sections. Blackboard course material, handouts and other specified reading.
Prerequisites	BJ60F0000 Selluloosatekniikan perusteet attended or corresponding knowledge of forest industry.

BJ60F0300	***FIBER TECHNOLOGY; PERSONAL ASSIGNMENT*** ***6 ECTS cr***
	Fiber Technology; Personal Assignment **The course is mainly intended for foreign visiting students and students having chemical pulping technology as their major. The students register for the course by contacting the instructor.**
Year and Period	Period 1-4
Lecturer(s)	Professor, M.Sc. (Tech.) Kaj Henricson

	Lecturer, N. N.
Aims	To give the student a deeper understanding of a specialized area of fiber technology and give the student training in working independently on a specified subject.
Contents	The personal assignment is planned together with the instructor(s) and consists mainly of a personal assignment, literature work and report writing and/or an examination. The course may contain lectures and seminars. The assignment may also be planned together with industry and then carried out at some industrial location.
Teaching Methods	As agreed with the instructor. The number of students accepted for the course will be limited.
Assessment	0-5. Depending on the assignment the grade will be given based on an examination and/or the assignment.
Course Material	Literature related to the project.

BJ80A0300	***TRANSPORT PHENOMENA***	***3 ECTS cr***
	Transport Phenomena	
Year and Period	M.Sc. (Tech.) 1, Period 2	
Lecturer(s)	Professor, D.Sc. (Tech.) Matti Lindström	
Aims	Student understands the theoretical basis of transport phenomena in gas and liquid phase and is able to apply calculation methods in solving problems concerning transport.	
Contents	Diffusion, migration and convection of molecules and ions in gas and liquid phase. Calculation of transport controlled by diffusion or migration in catalysis and electrochemistry. Kinetic theory and transport properties of gases.	
Teaching Methods	Lectures and seminars 21 h, exercises 14 h, 2nd period. Active participation in lectures and exercises.	
Assessment	0-5, written examination 100 %.	
Course Material	Lindström, M., Transport Phenomena, Lecture Notes, LUT, 2005. Atkins, P. & de Paula, J., Atkins' Physical Chemistry (8th ed.), Oxford University Press, 2006, Chapter 21.	
Prerequisites	BM30A0210 Fysiikka L, osa 1, BM30A0230 Fysiikka L, osa 3, BM30A0320 Fysiikan laboratoriotyöt (KETE, KOTE) and BJ70A0000 Epäorgaaninen kemia I (lectures attended).	

BJ80A0800	***PROPERTIES OF GASES AND LIQUIDS***	***5 ECTS cr***
	Properties of Gases and Liquids **The course will be lectured 1st time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Professor, D.Sc. (Tech.) Matti Lindström	
Aims	To be able to estimate physico-chemical properties of pure gases and liquids and their mixtures.	
Contents	The estimation of physical properties, pure component constants, thermodynamic properties of gases, pressure-volume-temperature relationships of pure gases and liquids, pressure-volume-temperature relationships of mixtures, thermodynamic properties of pure components and mixtures.	
Teaching Methods	Lectures 21 h, exercises and seminars 14 h, 3rd and 4th period. Active participation in lectures and exercises.	
Assessment	0-5, written examination 100 %.	
Course Material	Poling, B. E., Prausnitz, J. M. And O'Connell, J. P., The Properties of Gases and Liquids, 5th ed., McGraw-Hill, Boston, 2001, Chapters 1-6.	
Prerequisites	BJ80A0100 Johdanto kemialliseen termodynamiikkaan and BJ80A0200 Kemiallisten tasapainotilojen termodynamiikka passed.	

BJ90A0400	CATALYSIS	4 ECTS cr
	Catalysis **The course will be lectured next time during the academic year 2008 - 2009.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Erkki Paatero	
Aims	The course gives the theoretical basis for homogeneous and heterogeneous catalysts and how they work in chemical reactors.	
Contents	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. Suitable also for post-graduate studies.	
Teaching Methods	Lectures and exercises 28 h, 1st period. Laboratory demonstration and homework.	
Assessment	0-5, written examination 100 %, homework passed.	
Course Material	Thomas, J.M. & Thomas, W.J., Principles and Practice of Heterogeneous Catalysis, John Wiley & Sons, Inc., 1997.	
Prerequisites	BJ90A0000 Kemianteollisuuden prosessit.	

BJ90A0600	INDUSTRIAL BIOTECHNOLOGY	2 ECTS cr
	Industrial Biotechnology **The course will be lectured last time in spring 2008.**	
Year and Period	M.Sc. (Tech.) 1-2, Period 3-4	
Lecturer(s)	D.Sc. (Tech.) Heikki Ojamo	
Contents	What is industrial biotechnology? Basics of biocatalysts and their industrial use. Fermentation and enzyme technology. Downstream processing. Specific features of mass and heat transfer in biotechnology. Asepticity. Enzyme applications. Biotechnology and sustainable growth.	
Teaching Methods	Lectures 14 h, in three intensive days. A written literature survey on a specific subject.	
Assessment	0-5, written examination 80 %, literature survey 20 %.	
Course Material	Aittomäki, E. et. al., BIOprosessitekniikka, WSOY 2002 (where applicable). Literature surveys.	
Prerequisites	BJ70A0300 Teknillisen biokemian perusteet.	

BJ90A0700	CHEMICAL SEPARATION METHODS	4 - 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	
Lecturer(s)	Professor, D.Sc. (Tech.) Erkki Paatero Researcher/Teacher, D.Sc. (Tech.) Tuomo Sainio	
Aims	The course gives the theoretical basis for chemically assisted separation methods.	
Contents	The focus during the course is on the chemistry involved in the application of solvent extraction, ion-exchange, adsorption, chromatographic separation and flotation. Applications of these technologies are found widely in industry although mostly in hydrometallurgy, food industry and pharmaceutical industry.	
Teaching Methods	Lectures and seminars 28 h, 3rd period. Lectures and seminars 7 h, 4th period. Oral or written examination. The students of the Master's Degree Programme in Chemical and Process Engineering (IPPE): the course also includes a literature survey and laboratory	

	work approximately 40 h, the extent of the course will then be 8 ECTS cr.
Assessment	4 ECTS cr: 0-5, examination 100 %. 8 ECTS cr: 0-5, examination 70 %, seminar 30 %.
Prerequisites	BJ90A0000 Kemianteollisuuden prosessit.

BJ90A0800	***NUTRITIONAL AND FOOD BIOTECHNOLOGY 3 ECTS cr***
	Nutritional and Food Biotechnology **The course will be lectured last time in autumn 2007.**
Year and Period	M.Sc. (Tech.) 1-2, Period 2
Lecturer(s)	Professor, Ph.D. Atte von Wright
Aims	The aim is to give an introduction to food biotechnology, with a special emphasis on nutrition, hygiene and food safety.
Contents	The starter cultures and micro-organisms used in food industry, hygienic and safety aspects. Health, nutritional and safety concerns related to genetic modification, functional foods and novel foods.
Teaching Methods	Intensive course. Lectures 20 h, 2nd period.
Assessment	0-5, written examination 100 %.
Prerequisites	BJ70A0300 Teknillisen biokemian perusteet

8 Master's Degree Programme in Mechanical Engineering

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

The Aims of the Master's Degree Programme

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

Careers for Graduates

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

The Structure of the Programme

Major Subject 71 ECTS cr - **Master's Thesis 30 ECTS cr** - **Structural and Machine Design 41 ECTS cr or Production Technologies 41 ECTS cr**	**Minor Subject 20-21 ECTS cr**
General Studies 13-15 ECTS cr	**Elective Studies 13-17 ECTS cr**

General Studies (13-15 ECTS credits):
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 (41 ECTS credits):
The Department of Mechanical Engineering offers major subjects in Structural and Machine Design and in Production Technologies. The choice of the major is made at the end of the 3rd period of the first year.

Structural and Machine Design
The person responsible for major in Structural and Machine Design is professor, D.Sc. (Tech.) Gary Marquis.
Students study 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 so that complex mechatronic systems and structures can be designed,

tested and optimised before a prototype is fabricated. Major in Structural and Machine Design includes advanced studies of machine automation, steel structures and virtual design.

Production Technologies
The person responsible for major in Production Technologies is professor, D.Sc. (Tech.) Jukka Martikainen.
Students learn about modern production systems and production planning that will be integral parts of tomorrow's factories. Special emphasis is given to welding technology, high technology machining operations and sheet metal and plate forming. Moreover, students have the opportunity to develop expertise in laser welding and cutting together with a variety of surface improvement techniques including laser cladding and surface hardening. Major in Production Technologies includes advanced studies of welding technology, production technology and laser technology.

Master's Thesis (30 ECTS credits):
The Master's thesis is a research or design project carried out in the field of the student's major subject.

Minor Subject (20-21 ECTS credits):
Students can choose any minor subject taught in Englist at LUT.

Elective Studies (13-17 ECTS credits):
To attain the full 120 ECTS credits, the students may need to take some additional courses. Elective studies can include any courses offered by Lappeeranta University of Technology if the required prerequisites are completed. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise.

General Studies 13-15 ECTS credits

General Studies		*year*	*per.*	*ECTS cr*
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
BK20A0100	Materials Science	M.Sc. (Tech.) 1	1-2	6
FV11A9000	Academic Seminar for International Programs		2–4	6
FV13A1200(*	Teknisk svenska	B.Sc. (Tech.) 1-3	1, 2, 3, 4	2
FV18A9100(**	Finnish for Foreigners 1		1, 3	2

*) For Finnish students who need to attain proficiency in Swedish
**) Foreign students are required to study at least one course of Finnish language

Major in Structural and Machine Design (71 ECTS credits) Students should select Master's Thesis 30 ECTS credits and a minimum of 41 ECTS credits from the above courses:

Major in Structural and Machine Design		*year*	*per.*	*ECTS cr*
BK10A0100(*	Individual Project Work	M.Sc. (Tech.) 1	1-4	6
BK10A0200(*	Research Seminar	M.Sc. (Tech.) 2	4	2
BK60A0300	Servo Control Engineering	B.Sc. (Tech.) 3	3-4	6
BK70A0400	Introduction to Multibody Dynamics	B.Sc. (Tech.) 3	3	4
BK80A0500(**	Lujuusoppi II	B.Sc. (Tech.) 3	1-2	7
BK80A1000	Design of Steel Structures	M.Sc. (Tech.) 1	3-4	6
BK80A1200(*	FE-analysis course	B.Sc. (Tech.) 3	3-4	5
BK80A1400	Fatigue Design	M.Sc. (Tech.) 1	1-2	6
BK80A1600	FE-analysis Seminar in Advanced Topics	B.Sc. (Tech.) 3	1-4	3
Thesis	Master's Thesis			30

*) A required course
**) Will be lectured in English in 2008-2009

Major in Production Technologies (71 ECTS credits)

Major in Production Technologies		*year*	*per.*	*ECTS cr*
BK10A0100	Individual Project Work	M.Sc. (Tech.) 1	1-4	6
BK10A0200	Research Seminar	M.Sc. (Tech.) 2	4	2
BK20A0400	Modern Welding Technology	M.Sc. (Tech.) 2	1-2	7

BK20A1100	Virtual Welding	M.Sc. (Tech.) 1	3-4	3
BK30A0100	Laser Processes	M.Sc. (Tech.) 1	1-2	6
BK30A0200	Product Design for Laser Processing	M.Sc. (Tech.) 1	3-4	4
BK50A0700	Advanced Production Engineering	M.Sc. (Tech.) 1	1-2	7
BK90A1000	Wood Processing Machinery	B.Sc. (Tech.) 3	3	6
Thesis	Master's Thesis			30

Minor in Structural and Machine Design (21 ECTS cr)

Minor in Structural and Machine Design (21 ECTS cr)		*per.*	*ECTS cr*
BK70A0400	Introduction to Multibody Dynamics	3	4
BK80A1000	Design of Steel Structures	3-4	6
BK80A1200	FE-analysis course	3-4	5
BK80A1400	Fatigue Design	1-2	6

Minor in Production Technologies (20 ECTS cr)

Minor in Production Technologies (20 ECTS cr)		*per.*	*ECTS cr*
BK20A0400	Modern Welding Technology	1-2	7
BK20A1100	Virtual Welding	3-4	3
BK30A0100	Laser Processes	1-2	6
BK30A0200	Product Design for Laser Processing	3-4	4

Additional Information

Personal Study Plans:
In the beginning of their studies, students prepare a personal study plan, in which the student and the Department agree on what studies the student will pursue and in what order. This plan includes detailed information on major subject, minor subject, general studies, elective studies, credit transfer from previous degree and possible complementary studies.

Complementary Studies (20-60 ECTS credits):
Students with a Finnish polytechnic degree or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree.

Further Information:
International Officer Minna Loikkanen
Phone +358 5 621 2268, room 2321, minna.loikkanen@lut.fi
www.lut.fi/kote/international_studies/

The Courses Offered in English

		ECTS cr
BK10A0100	Individual Project Work	6
BK10A0200	Research Seminar	2
BK10A0300	Introduction to M.Sc. Studies	1
BK20A0100	Materials Science	6
BK20A0400	Modern Welding Technology	7
BK20A1100	Virtual Welding	3
BK30A0100	Laser Processes	6
BK30A0200	Product Design for Laser Processing	4
BK50A0700	Advanced Production Engineering	7
BK60A0300	Servo Control Engineering	6
BK70A0000	Simulation of a Mechatronic Machine	6
BK70A0400	Introduction to Multibody Dynamics	4
BK80A0500	Advanced Strength of Materials	7
BK80A0900	Structural Analysis	6
BK80A1000	Design of Steel Structures	6
BK80A1200	FE-analysis course	5
BK80A1400	Fatigue Design	6
BK80A1600	FE-analysis Seminar in Advanced Topics	3
BK90A1000	Wood Processing Machinery	6
BK90A1100	Measuring Technology at Mechanical Wood Processes	6

Course Descriptions

BK10A0100	***INDIVIDUAL PROJECT WORK***	***6 ECTS cr***
	Individual Project Work **Only for th students of Master's degree programmes of the Department of Mechanical Engineering.**	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Lecturer(s)	Professors Department of Mechanical Engineering	
Contents	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.	
Teaching Methods	10 h of lectures, 1st-4th period. 150 h of tutorials and independent projects, 1st-4th period.	
Assessment	Passed/not passed, based on written report and oral presentation.	
Prerequisites	Consent of supervising professor.	

BK10A0200	***RESEARCH SEMINAR***	***2 ECTS cr***
	Research Seminar	
Year and Period	M.Sc. (Tech.) 2, Period 4	
Contents	International students will present and defend their own diploma project thesis work as well as serve as opponents and listen to other presentations.	
Teaching Methods	Excercises 10 h, 4th period. Simulation work 40 h.	
Assessment	Passed/not passed grade based on participation.	

BK10A0300	INTRODUCTION TO M.SC. STUDIES	1 ECTS cr
	Introduction to M.Sc. Studies	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Gary Marquis, Information Specialist, M.Sc. Marja Talikka	
Contents	This course will help orient international students to the basics of study at LUT. Orientation week activities, information gathering, and essay.	
Teaching Methods	Lectures 8 h, 1st period. Excercises 10 h Independent work 8 h	
Assessment	Passed/not passed grade based on participaton, exercises and essay.	
Course Material	LUT Web.	

BK20A0100	MATERIALS SCIENCE	6 ECTS cr
	Materials Science	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Senior Assistant, Lic.Sc. (Tech.) Raimo Suoranta Assistant, Lic.Sc. (Tech.) Pekka Rajamäki	
Aims	The student is capable to select proper material according to functionality and economically.	
Contents	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 selectin materials.	
Teaching Methods	28 h of lectures, 1st-2nd period. 42 h of independent work, 1st-2nd period.	
Assessment	0-5, examination 75 %, tutorials 25 %.	

BK20A0400	MODERN WELDING TECHNOLOGY	7 ECTS cr
	Modern Welding Technology	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Jukka Martikainen Senior Assistant, Lic.Sc. (Tech.) Raimo Suoranta	
Contents	Productivity, economy and quality in welding. Welding costs. Productive and efficient new welding methods. Welding materials. The mechanisation and robotisation of welding. Mechanisation and robotisation equipments and systems. On-line and off-line programming. The design of welded structures. Modulation. Modelling and simulation in welding. Methods for preparing roots. Welding FMU and FMS. Lay-out in welding workshop. The quality, environmental and safety in welding workshop. Welding in the future. Adaptive welding. Welding in the global welding workshop.	
Teaching Methods	4 h of lectures, 1st-2nd period. 14 h of laboratory tutorials. 28 h of laboratory- and seminar presentations	
Assessment	0-5, examination 80 %, laboratory- and seminar prentations 20 %.	
Course Material	WebCT material. Lecture notes.	

BK20A1100	VIRTUAL WELDING 3 ECTS cr
	Virtual Welding
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Part-time Untenured Teacher, M.Sc. (Tech.) Esa Hiltunen
Aims	Be able to apply tools of computer technology on workshop operation planning, for example on simulation of robot welding system. Know, what are the opportunities and limitations of these tools.
Contents	Welding production planning of workshops. Modelling and simulation of robot welding system. Virtual technology and its applications in mechanical engineering. Basis of virtual modelling. Basis of industrial robots and their construction. Planning of productive robotized welding. Definition of welding process parameters.
Teaching	2 h of lectures, 3rd period.
Methods	12 h of controlled tutorials, 3rd-4st period.
Assessment	0-5, examination 100 %.
Course Material	WebCT.

BK30A0100	LASER PROCESSES 6 ECTS cr
	Laser Processes
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Veli Kujanpää Docent, D.Sc. (Tech.) Antti Salminen
Aims	Readiness to understand the special features of laser processing in production and product design.
Contents	Basic knowledge on different laser processing systems and processes and the interaction between laser beam and materials. Basic knowledge on laser welding, cutting and surface treatment. Optics of laser processing, safety and quality assurance. Practical cases. Basics of the interaction between laser beam and materials, absorption, keyhole and its usefulness on laser welding and cutting.
Teaching	28 h of lectures, 1st-2nd period.
Methods	16 h of tutorials, 1st-2nd period.
Assessment	0-5, examination 90 %, seminar 10 %.
Course Material	Steen W., Laser material processing. Material presented during lectures.

BK30A0200	PRODUCT DESIGN FOR LASER PROCESSING 4 ECTS cr
	Product Design for Laser Processing
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Docent, D.Sc. (Tech.) Antti Salminen
Aims	Readiness to use laser processing possibilities on the tasks of product design.
Contents	Special features of laser processing methods for product design. The effect of laser processing devices, process features, materials and processing results on product design. Practical examples on product design and its effects on product properties. Special features of laser processing and its usefulness on product design.
Teaching	28 h of lectures, 3rd-4th period.
Methods	14 h of tutorials, 3rd-4th period.
Assessment	0-5, examination 50%, seminar 50%.
Course Material	Kujanpää V. et al., Lasertyöstö. Steen W., Laser material processing.
Prerequisites	BK30A0000 Sädetyöstö or BK30A0100 Laser Processes

BK50A0700	ADVANCED PRODUCTION ENGINEERING 7 ECTS cr
	Advanced Production Engineering
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Varis
Aims	This course will deepen the student's knowledge of the most advanced design and production methods, equipment, equipment systems and modern product facilities used especially in the manufacture of thin and rough sheet metal products. The student will also learn to understand the role of manufacturing as a part of the company's strategy and to design and use production systems. The course will provide the student with the ability to handle duties in factory management and development as well as in research in the field.
Contents	The manufacturing methods for modern metal cutting and sheet metal production. The advanced production methods for punching, folding and mechanical joining of sheet metal products. The production control systems of flexible automatic (FMS, IMS) production factories. The significance and technologies of product design as well as of production (CAD, CAP, PPS, CAM) especially in the manufacture of thin and rough sheet metal production. DFMA and costs functions of products, production controlling and simulation. The operation of a factory as part of a principal-supplier network. The technology and methods for improving production. The material handling, production and information systems of a workshop. The development of the operations of a workshop and quality technology.
Teaching Methods	30 h of lectures, 1st-2nd period. 28 h of exercises, 1st-2nd period. 56 h of laboratory tutorials, 1st-2nd period. Seminar 20 h, 1st-2nd period.
Assessment	0-5, examination 60 %, satisfactorily completed tutorials 20 %, project work 20 %.
Course Material	Materials to be announced during lectures.

BK60A0300	SERVO CONTROL ENGINEERING 6 ECTS cr
	Servo Control Engineering
Year and Period	B.Sc. (Tech.) 3, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Heikki Handroos
Contents	Control of Hydraulic, Pneumatic, and electrical servodrives. Structures and properties of basic types of servo-drives. Selection of appropriate control methods for different drive types. Fuzzy control of servodrives. Ability to design and control of different types of servodrives. Ability to evaluate the achievable properties of different servodrives.
Teaching Methods	42 h of lectures, 3rd-4th period. 42 h of tutorials, 3rd-4th period. 30 h of exercises, 4th period.
Assessment	0-5, examination 100 %.
Course Material	Lecture notes.
Prerequisites	The student must have completed BK60A0000 Mekatroniikan peruskurssi. Recommended BK60A0100 Hydraulitekniikka (not required from International Master's Programme students).

BK70A0000	SIMULATION OF A MECHATRONIC MACHINE 6 ECTS cr
	Simulation of a Mechatronic Machine
Year and Period	B.Sc. (Tech.) 3, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Aki Mikkola
Aims	The student will obtain the theoretical ability for the mathematical modelling and computer simulation of machine systems that are hydraulically,

	pneumatically or electronically actuated. The student will also obtain knowledge to utilize static, kinematic and dynamic analysis in a machine design process.
Contents	Principles of multibody dynamics, modelling of actuators, coupled simulation. Description of mechanic flexibility. The use of Lagrangian equation. Constraint equations and Lagrangian multipliers. Inertia of rigid bodies. Modeling of hydraulic components. Numerical integration of the equation of motion. Rotation matrix in spatial cases.
Teaching	28 h of lectures, 3rd-4th period.
Methods	28 h of supervised tutorials, 3rd-4th period.
Assessment	0-5, examination or mid-course examinations 90 %, simulation work 10 %.
Course Material	Lecture notes.
Prerequisites	Students are recommended to have completed BK60A0000 Mekatroniikan peruskurssi, BK80A0000 Statiikka, BK80A0100 Dynamiikka I BK80A0200 Dynamiikka II (not required from International Master's Programme students).

BK70A0400	***INTRODUCTION TO MULTIBODY DYNAMICS 4 ECTS cr***
	Introduction to Multibody Dynamics
Year and Period	B.Sc. (Tech.) 3, Period 3
Lecturer(s)	Professor, D.Sc. (Tech.) Aki Mikkola
Aims	The student will obtain the theoretical ability for the mathematical modelling and computer simulation of machine systems that consists of rigid bodies.
Contents	Principles of multibody dynamics. The use of Lagrangian equation. Constraint equations and Lagrangian multipliers. Inertia of rigid bodies. Numerical integration of the equation of motion. Rotation matrix in spatial cases.
Teaching	Lectures of 14 h, 3rd period.
Methods	Exercises of 14 h, 3rd period.
Assessment	0-5, examination 90 %, simulation work 10 %.
Course Material	Lecture notes.
Prerequisites	Students are recommended to have completed BK80A0000 Statiikka, BK80A0100 Dynamiikka I, BK80A0200 Dynamiikka II (not required from International Master's Programme students).

BK80A0500	***ADVANCED STRENGTH OF MATERIALS 7 ECTS cr***
	Lujuusoppi II **Alternate years Lujuusoppi II/Advanced Strength of Materials**
Year and Period	B.Sc. (Tech.) 3, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Gary Marquis Researcher/Teacher, D.Sc. (Tech.) Tapani Halme Senior Assistant, D.Sc. (Tech.) Timo Nykänen
Aims	The course is a continuation of the basic course and is intended to provide students with a more thorough background in solid mechanics and strength of materials.
Contents	Unsymmetric beam bending, states of stress and strain, generalized Hooke's law, behaviour of orthotropic materials and laminates, thick-walled axi-symmetric shells, stress function, experimental methods in strength of materials, deformation energy and failure theories, St. Venant's theory for torsion, Prandtl membrane analogy, restrained warping of thin-walled open sections, stresses in curved bars, deformation of circular members, composite beams, columns and beam-columns, equilibrium solutions for elastic buckling, plastic bending and torsion, plastic limit analysis.
Teaching	42 h of lectures, 1st-2nd period.
Methods	42 h of tutorials, 1st-2nd period.

	1 h of laboratory work. 8 h of independent work.
Assessment	0-5, examination or two intermediate examinations 100% (85%), laboratory work (5%), exercises (10%).
Course Material	Lecture notes. Ugural A.C. and Fenster S.K., Advanced strength and applied elasticity. -4th ed.
Prerequisites	BK80A0300 Lujuusoppi I tutorials completed or registration in the International Master's degree programme.

BK80A0900	***STRUCTURAL ANALYSIS***	***6 ECTS cr***
	Structural Analysis	
Year and Period	B.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Gary Marquis Part-time Untenured Teacher, M.Sc. (Tech.) Sami Heinilä	
Aims	Drawing shear and moment diagrams, constructing influence lines. Use of STRAN computer program.	
Contents	Application of basic geometry and static principals to the analysis of simple structural components. Structures include frame, beam and truss structures. Indeterminacy and exact and approximate methods for indeterminate structures. Energy methods and force methods.	
Teaching Methods	42 h of lectures, 1st-2nd period. 18 h of tutorials, 1st-2nd period. 20 h of laboratory work.	
Assessment	0-5, examination 50 %, exercises 50 %.	
Course Material	Hibbeler R.C., Structural Analysis - 5th ed., Prentice-Hall, 2002.	
Prerequisites	Static equilibrium, understand shear forces, normal forces and bending moments BK80A0000 Statiikka and BK80A0300 Lujuusoppi I.	

BK80A1000	***DESIGN OF STEEL STRUCTURES***	***6 ECTS cr***
	Design of Steel Structures	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Professor, D.Sc. (Tech.) Gary Marquis	
Aims	Use of AGIFAP computer program.	
Contents	Principals of design for welded mechanical engineering structures. Theory of buckling, fatigue of welded structures, introduction to limit state design, yield line theory, welding residual stresses. Design to avoid buckling of slender members, design to avoid fatigue failure, design of welded joints, optimization of beams.	
Teaching Methods	42 h of lectures, 3rd-4th period. 10 h of tutorials 3rd-4th period. 5 h of laboratory work, 3rd-4th period.	
Assessment	0-5, examination 60 %, laboratory projects and reports 40 %.	
Course Material	Niemi E., Levyrakenteiden suunnittelu, 2003.	
Prerequisites	BK80A1100 FE-analyysin peruskurssi or BK80A1200 FE-analysis course	

BK80A1200	***FE-ANALYSIS COURSE***	***5 ECTS cr***
	FE-analysis course	
Year and Period	B.Sc. (Tech.) 3, Period 3-4	
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Pasi Tanskanen	
Aims	The aim of this course is to ensure that the student has a good knowledge of the theoretic fundamentals of FE analysis as well as a basis for the reliable use of FEM software.	
Contents	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.
Teaching Methods	28 h of lectures, 3rd-4th period. 28 h of tutorials, 3rd-4th period.
Assessment	0-5, examination 50 %, exercises 50 %.
Course Material	The material is to be specified during lectures.

BK80A1400	***FATIGUE DESIGN***	***6 ECTS cr***
	Fatigue Design	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Gary Marquis	
Contents	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.	
Teaching Methods	42 h of lectures, 1st-2nd period. 40 h of tutorials, 1st-2nd period.	
Assessment	0-5, examination 60 %, exercises 40 %.	
Course Material	Dowling N.E., Mechanical Behavior of Materials 2nd ed., Prentice Hall.	
Prerequisites	BK80A0500 Lujuusoppi II or BK20A0100 Materials Science.	

BK80A1600	***FE-ANALYSIS SEMINAR IN ADVANCED TOPICS***	***3 ECTS cr***
	FE-analysis Seminar in Advanced Topics **Course registrations directly to the lecturer, WebOodi not in use.**	
Year and Period	B.Sc. (Tech.) 3, Period 1-4	
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Pasi Tanskanen	
Aims	To better prepare the student for industrial problem solving or research work by giving more in-depth instruction on numerous advanced topics in finite element analysis.	
Contents	The course will cover numerous advanced topics in finite element analysis especially for mechanical engineers, e.g., solution techiques, stability and dynamic eigenvalue problems, sub-modeling and sub-structure techniques, and nonlinear analysis.	
Teaching Methods	Lectures 14 h, 1st-4th period.	
Assessment	0-5, exercises 100 %.	
Course Material	The material is to be specified during lectures.	
Prerequisites	BK80A1200 FE-analysis course.	

BK90A1000	***WOOD PROCESSING MACHINERY***	***6 ECTS cr***
	Wood Processing Machinery	
Year and Period	B.Sc. (Tech.) 3, Period 3	
Lecturer(s)	Researcher, M.Sc. (Tech.) Kimmo Piispa	
Aims	Comprehensive insight on machinery and processes used in the primary wood processing industry. Basic knowledge of raw material handling, debarking, chipping, cutting processes, saws, sorting, drying and secondary machinery. Practical knowledge of sawmills including a sawmill visit and a written report. Student makes an individual written report on a selected subject and presents it in a seminar.	

Contents	Primary wood processing technologies and machinery. Production planning, wood as raw material, maintenance, environment and labour safety.
Teaching Methods	32 h lectures, 3rd period. 16 h mill visits and seminars, 3rd period. 24 h independent projects, 3rd period. Two written reports, final examination.
Assessment	0-5, Final examination 80 %, written reports and approved seminar attendance 20 %.
Course Material	Vuorilehto J., Wood Processing Machinery, Course Book.

BK90A1100	***MEASURING TECHNOLOGY AT MECHANICAL WOOD PROCESSES 6 ECTS cr***
	Measuring Technology at Mechanical Wood Processes
Year and Period	M.Sc. (Tech.) 1-2, Period 4
Lecturer(s)	Researcher, M.Sc. (Tech.) Kimmo Piispa
Aims	Comprehensive insight on techniques and equipment used in the primary and secondary wood processing industry. Basic knowledge of statistical control, measuring devises, scanners and optimization. Practical knowledge of dimension control including an analysis of a saw process in a sawmill with a written report. Student makes an individual written report on a selected subject and presents it in a seminar.
Contents	Measuring and control techniques and systems in mechanical wood industry. Physics and use of measuring techniques and devises.
Teaching Methods	32 h lectures, 3rd period. 16 h mill visits and seminars, 3rd period. 24 h independent projects, 3rd period. Two written reports, final examination.
Assessment	0-5, Final examination 80 %, written reports and approved seminar attendance 20 %.
Course Material	Vuorilehto J., Measuring Technology at Mechanical Wood Processes, Course Book.
Prerequisites	BK90A1000 Wood Processing Machinery suoritettuna.

9 Master's Degree Programme "New Packaging Solutions"

The Master's degree programme "New Packaging Solutions" is a part-time programme leading to the degree of Master of Science in Technology. Students have two years (90 ECTS credits) of coursework in which all lectures, exercises and laboratory work are conducted in English. The Master's thesis (30 ECTS credits) will be conducted after the other courses have been completed.

The Aims of the Master's Degree Programme

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

Careers for Graduates

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

The Structure of the Programme

Major Subject 70 ECTS cr - **Packaging Technologies 40 ECTS cr** - **Master's Thesis 30 ECTS cr**	**Minor Subject 20 ECTS cr** **Industrial Management**
General Studies 20 ECTS cr	**Elective Studies 10 ECTS cr**

General Studies (20 ECTS credits):
General studies are common to all the students in the programme. The studies provide a brief introduction to the packaging field and packaging materials as well as language & communication skills essential for M.Sc. studies.

Major Subject (40 ECTS credits):
The person responsible for major subject in Packaging Technologies is professor, D.Sc. (Tech.) Juha Varis.
The main focus of the major subject is on paper and paperboard converting technologies, packaging machinery and packaging technologies, planning and design of packaging solutions and understanding of packaging chain demands.

Master's Thesis (30 ECTS credits):
The Master's thesis is a research or design project, which will be written after the other courses have been completed. It is carried out in the field of the student's major subject.

Minor Subject (20 ECTS credits):
The minor subject Industrial Management is offered by the Department of Industrial Engineering and Management. It is specially designed to support the major subject in Packaging Technologies and it will be offered on a part-time basis once a year. Choices of other minor subjects will be treated on a case-by-case basis.

Elective Studies (10 ECTS credits):
To attain the full 120 ECTS credits, the students may need to take some additional courses. Elective studies can include any courses offered by Lappeenranta University of Technology if the required prerequisites are completed. Elective studies may include a maximum of 6 ECTS credits of internship improving expertise. Foreign students are recommended to study Finnish for Foreigners courses.

General Studies (20 ECTS credits)

1. General Studies (20 ECTS cr)		*year*	*per.*	*ECTS cr*
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
BK10A0800	Introduction to M.Sc. Studies in Packaging	M.Sc. (Tech.) 1	1	1
BK20A1200	Interaction of the Package and the Content	M.Sc. (Tech.) 1	3-4	3
BK20A1300	Packaging Materials	M.Sc. (Tech.) 1	1-2	4
FV10A 11EC(*	Language and Communication Studies			11

*) FV13A1200 Teknisk svenska for Finnish students who need to attain proficiency in Swedish. The following studies of English language are recommended:

FV11A6200 English for Negotiating 3 ECTS cr, year 1, per. 3-4
FV11A4200 Writing for Business 2 ECTS cr, year 1, per. 1,2,3,4
FV11A9750 Aspects of Culture 3 CTS cr, year 2, per. 1-2
FV11A9300 Scientific and Technical English Writing Course 4 ECTS cr, year 2, per. 1-4

Major Subject in Packaging Technologies (70 ECTS credits)

Major Subject in Packaging Technologies (70 ECTS cr)		*year*	*per.*	*ECTS cr*
BK10A0100	Individual Project Work	M.Sc. (Tech.) 1	1-4	6
BK10A0200	Research Seminar	M.Sc. (Tech.) 2	4	2
BK20A1400	Coating and Lamination of Fibre Based Packaging Materials	M.Sc. (Tech.) 1	1-3	5
BK30A0400	Laser in Converting and Packaging	M.Sc. (Tech.) 2	1-2	2
BK50A1200	Machine Design for Packaging Technology	M.Sc. (Tech.) 1	3-4	2
BK50A1300	Converting and Forming of Fibre Based Packaging	M.Sc. (Tech.) 2	1-2	5
BK50A1400	Packaging Lines and Machinery	M.Sc. (Tech.) 2	3-4	8
BK50A1500	Printing and Varnishing	M.Sc. (Tech.) 1	2-3	2
BK50A1600	Functions of Package and Packaging Formats	M.Sc. (Tech.) 2	1-2	4
BK50A1700	Legislation on Packaging and Environmental Issues Related to Packaging	M.Sc. (Tech.) 2	1-3	4
Thesis	Master's Thesis			30

Minor Subject Industrial Management (20 ECTS credits)

Industrial Management (20 ECTS cr)		*per.*	*ECTS cr*
CS20A6000	Supply Chain Management	int.	6
CS20A6050	Decision-Making in Supply Chain	int.	5
CS30A6000	Technology Management	int.	3
CS35A6000	Information & Knowledge Management in Innovative Enterprises	4 int.	6

Additional Information

Personal Study Plans:
In the beginning of their studies, students prepare a personal study plan, in which the student and the Department agree on what studies the student will pursue and in what order. This plan includes detailed information on major subject, minor subject, general studies, elective studies, credit transfer from previous degree and possible complementary studies.

Complementary Studies (20-60 ECTS credits):
Students with a Finnish polytechnic degree or equivalent will have to study complementary studies. The extent of these studies depends on the content of the previous degree.

Further Information:
International Officer Minna Loikkanen
Phone +358 5 621 2268, room 2321, minna.loikkanen@lut.fi
www.lut.fi/kote/international_studies/

The Courses Offered in English

		ECTS cr
BK10A0100	Individual Project Work	6
BK10A0200	Research Seminar	2
BK10A0300	Introduction to M.Sc. Studies	1
BK10A0800	Introduction to M.Sc. Studies in Packaging	1
BK20A1200	Interaction of the Package and the Content	3
BK20A1300	Packaging Materials	4
BK20A1400	Coating and Lamination of Fibre Based Packaging Materials	5
BK20A1500	Principles of Chemistry, Paper Technology and Food Technology	5
BK30A0400	Laser in Converting and Packaging	2
BK50A1200	Machine Design for Packaging Technology	2
BK50A1300	Converting and Forming of Fibre Based Packaging	5
BK50A1400	Packaging Lines and Machinery	8
BK50A1500	Printing and Varnishing	2
BK50A1600	Functions of Package and Packaging Formats	4
BK50A1700	Legislation on Packaging and Environmental Issues Related to Packaging	4
BK80A2000	Basics of Technical Mechanics	4
CS20A6000	Supply Chain Management	6
CS20A6050	Decision-Making in Supply Chain	5
CS30A6000	Technology Management	3
CS35A6000	Information & Knowledge Management in Innovative Enterprises	6

Course Descriptions

BK10A0100	***INDIVIDUAL PROJECT WORK***	***6 ECTS cr***
	Individual Project Work **Only for th students of Master's degree programmes of the Department of Mechanical Engineering.**	
Year and Period	M.Sc. (Tech.) 1, Period 1-4	
Lecturer(s)	Professors Department of Mechanical Engineering	
Contents	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.	
Teaching Methods	10 h of lectures, 1st-4th period. 150 h of tutorials and independent projects, 1st-4th period.	
Assessment	Passed/not passed, based on written report and oral presentation.	
Prerequisites	Consent of supervising professor.	

BK10A0200	*RESEARCH SEMINAR*	*2 ECTS cr*
	Research Seminar	
Year and Period	M.Sc. (Tech.) 2, Period 4	
Contents	International students will present and defend their own diploma project thesis work as well as serve as opponents and listen to other presentations.	
Teaching Methods	Excercises 10 h, 4th period. Simulation work 40 h.	
Assessment	Passed/not passed grade based on participation.	

BK10A0300	*INTRODUCTION TO M.SC. STUDIES*	*1 ECTS cr*
	Introduction to M.Sc. Studies	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Gary Marquis, Information Specialist, M.Sc. Marja Talikka	
Contents	This course will help orient international students to the basics of study at LUT. Orientation week activities, information gathering, and essay.	
Teaching Methods	Lectures 8 h, 1st period. Excercises 10 h Independent work 8 h	
Assessment	Passed/not passed grade based on participaton, exercises and essay.	
Course Material	LUT Web.	

BK10A0800	*INTRODUCTION TO M.SC. STUDIES IN PACKAGING*	*1 ECTS cr*
	Introduction to M.Sc. Studies in Packaging	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Varis International Officer, M.A. Minna Loikkanen	
Aims	To provide understanding of packaging branch and the degree programme.	
Contents	The course will introduce the packaging branch and packaging businesses and the main features of the degree programme. Students will make personal study plans.	
Teaching Methods	8 h lectures, 1st period. 10 h exercises, 1st period. 8 h independent work, 1st period.	
Assessment	Passed/not passed	
Course Material	Orientation days, Study guide Handouts.	

BK20A1200	*INTERACTION OF THE PACKAGE AND THE CONTENT*	*3 ECTS cr*
	Interaction of the Package and the Content	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Visiting lecturers, Professor, Ph.D. Atte von Wright, Docent, Ph.D. Henry Lindell	
Aims	Understanding of the main mechanisms about the interaction of package and the content especially in food packaging.	
Contents	Fundamentals of microbiology and toxicology relevant to packaging materials, packages, machinery and the packed products. Fundamentals of the interaction of the packaging and the content. The main analyzing methods of packages and packaging materials.	
Teaching	Lectures total 24 h, 3rd-4th period.	

Methods	Excercises total 12 h, 3rd-4th period.
Assessment	0-5, examination 70 %, excercises 30 %.
Course Material	Handouts.

BK20A1300	***PACKAGING MATERIALS***	***4 ECTS cr***
	Packaging Materials	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Visiting lecturer, Professor, Jurkka Kuusipalo	
Aims	To provide understanding of the packaging related properties of various packaging materials.	
Contents	The manufacture, physical and chemical properties (relevant for packaging) of the major packaging materials: paper, paperboard, corrugated board, wood, glass, metals, polymers including biopolymers and adhesives. Foreseeable future development of each material. Material composite possibilities and their use. Capability to select material alternatives or combinations for specific packaging solutions besed on their possible performance characteristics.	
Teaching Methods	Lectures total 16 h, 1st-2nd period. Exercises total 7 h, 1st-2nd period.	
Assessment	0-5, examination 70 %, excercises 30 %.	
Course Material	Course material. Lecturers' comments. Savolainen, A. ed., Paper and paperboard converting. In series of books: Papermaking science and technology, osa 12, Fapet, Helsinki.	

BK20A1400	***COATING AND LAMINATION OF FIBRE BASED PACKAGING MATERIALS***	***5 ECTS cr***
	Coating and Lamination of Fibre Based Packaging Materials	
Year and Period	M.Sc. (Tech.) 1, Period 1-3	
Lecturer(s)	Visiting lecturer, Professor, Jurkka Kuusipalo	
Aims	To provide understanding of various ways to combine materials with paper and board and of their properties in packaging applications.	
Contents	Raw materials, for main coating and laminating methods. Main properties (including pronting) 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.	
Teaching Methods	Lectures total 18 h, 1st-3rd period. Exercises total 8 h, 1st-3rd period. Seminar 1st-3rd period.	
Assessment	0-5, examination 70 %, excercises 30 %.	
Course Material	Course material. Lecturers' comments. Savolainen, A. ed., Paper and paperboard converting. In series of books: Papermaking science and technology, osa 12, Fapet, Helsinki.	

BK20A1500	PRINCIPLES OF CHEMISTRY, PAPER TECHNOLOGY AND FOOD TECHNOLOGY 5 ECTS cr
	Principles of Chemistry, Paper Technology and Food Technology **Belongs to only to complementary studies of New Packaging Solutions. Course registrations during 1st period.**
Year and Period	M.Sc. (Tech.) 1, Period 1-4
Lecturer(s)	Visiting lecturer, M.Sc. (Tech) Matti Salste
Aims	Understanding basic general, organic and biochemical phenomena. Understanding basics of paper technology and products. Understanding packaging related features of processed food.
Contents	Basic phenomena of general, organic and biochemistry. Main fibre grades and other raw materials and their role in paper products, the main part processes of paper production, typical properties of the main paper and board grades. The basic principles of foods and processing theory, the main food processes and their effect on foods considering packaging.
Teaching Methods	Essays with specific instruction.
Assessment	Pass/Fail.
Course Material	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, Second edition, Part I p 7-62, III and IV, p 229-452.

BK30A0400	LASER IN CONVERTING AND PACKAGING 2 ECTS cr
	Laser in Converting and Packaging **The course will be first time lectured during the academic year 2007-2008.**
Year and Period	M.Sc. (Tech.) 2, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Veli Kujanpää Lecturer, N. N.
Aims	To provide understanding for laser based processing in converting technology, paper and cardboard material, multimaterials, pigment and plastic coated, packaging lines.
Contents	The use of laser in converting of fibre based packaging materials and packaging line solutions. Laser processes like laser cutting, laser scoring, laser joining, and laser marking. Laser machines, optics and work stations in other applications. Product design for laser processing. Other special laser technologies. Capability to utilize laser technologies in converting and packaging.
Assessment	0-5, examination 90 %, tutorials 10 %.
Course Material	Will be announced later.

BK50A1200	*MACHINE DESIGN FOR PACKAGING TECHNOLOGY* *2 ECTS cr*
	Machine Design for Packaging Technology
Year and Period	M.Sc. (Tech.) 1, Period 3-4
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Harri Eskelinen
Aims	To provide understanding of most important mechanisms and their machine parts for packaging solutions by utilizing the basic theories of DFM(A).
Contents	Basic mechanisms types, mechanisms analysis and synthesis, reliability-based machine design, wear and lifetime analysis of selected machine parts and elements. Different methodologies of DFM(A) and means to apply them in packaging technology. Knowledge about how to design a simple machine or mechanisms for packaging operations and means to estimate functional aspects of applied technology.
Teaching Methods	Lectures total 14 h, 2nd-3rd period. Exercises total 26 h, 2nd-3rd period. Seminar 2nd-3rd period.
Assessment	0-5, examination 70 %, exercises and seminar 30 %
Course Material	Erdman A.G., Mechanism Design. Norton R.L., Design of Machinery.

BK50A1300	*CONVERTING AND FORMING OF FIBRE BASED PACKAGING* *5 ECTS cr*
	Converting and Forming of Fibre Based Packaging **The course will be first time lectured during the academic year 2007-2008.**
Year and Period	M.Sc. (Tech.) 2, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Juha Varis Visiting lecturer, Professor, Jurkka Kuusipalo
Aims	To provide understanding of various paper and board converting technologies and their developments in package production.
Contents	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.
Assessment	Written examination 60 %, seminar 40 % Laboratory works; passed/not passed
Course Material	Will be announced later

BK50A1400	*PACKAGING LINES AND MACHINERY* *8 ECTS cr*
	Packaging Lines and Machinery
Year and Period	M.Sc. (Tech.) 2, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Jukka Martikainen Lecturers N.N.
Aims	To provide understanding for operations and functions of packaging lines and their development aspects.

Contents	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.
Teaching Methods	Will be announced in 2007-2008 study guide.
Assessment	0-5, examination 100 %.
Course Material	Will be informed later.

BK50A1500	***PRINTING AND VARNISHING***	***2 ECTS cr***
	Printing and Varnishing	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Lecturer(s)	Guest Lecturer, D.Sc. (Tech.) Johanna Lahti	
Aims	To provide understanding of printing methods used in packaging industry. Capability to select a proper printing method for a certain packaging solution. Capability to solve printing problems and to control print quality.	
Contents	Pre-press operations. The main printing technologies and their use in packaging industry. Printing of various substrates. Composition of printing inks. Print quality and defects. Print quality measurements. Emerging printing technologies and their potential use in packaging industry. Future trends of printing technologies.	
Teaching Methods	Lectures total 12 h, 2nd-3rd period. Exercises total 6 h, 2nd-3rd period.	
Assessment	0-5, examination 70 %, exercises 30 %.	
Course Material	Course material. Lecturers' comments. Saarelma, H., Oittinen P., Printing. In series of books: Papermaking Science and Technology, Book 13, Fapet, Helsinki 1999.	

BK50A1600	***FUNCTIONS OF PACKAGE AND PACKAGING FORMATS***	***4 ECTS cr***
	Functions of Package and Packaging Formats	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	N.N. Lecturer(s) responsible: Professor, D.Sc. (Tech.) Juha Varis	
Aims	To provide understanding of various functions of packaging and packages and their future trends. To provide understanding of various formats of packages, their merits and shortfalls in logistic chain and end-use. To provide understanding of challenges of packages in specific end uses.	
Contents	Aspects of the role of packaging throughout the value chain. The main categories packages and their use. Aspects for understanding of the main opportunities of various packaging formats in specific end uses when developing new solutions.	
Teaching Methods	Lectures 24 h. Exercises/seminars 16 h.	
Assessment	0-5, assigments	

BK50A1700	*LEGISLATION ON PACKAGING AND ENVIRONMENTAL ISSUES RELATED TO PACKAGING*	*4 ECTS cr*
	Legislation on Packaging and Environmental Issues Related to Packaging	
Year and Period	M.Sc. (Tech.) 2, Period 1-3	
Lecturer(s)	Visiting lecturers, Professor, Ph.D Atte von Wright M.Sc. Päivi Harju-Eloranta	
Aims	To provide understanding of packaging related legislation and sustainanability aspects and their impact on the packaging business.	
Contents	The main content of the EU legislation of chemical, biological and microbiological hygienic and purity aspects in the packaging. Environmental issues of packaging and packaging waste and the relevant legislation. The environmental standardization of packages in EU. Sustainability aspects concerning packaging legislation on product sagety aspects and traceability.	
Teaching Methods	Lectures total 18 h, 1st-3rd period. Exercises total 14 h, 1st-3rd period. Seminar 1st-3rd period.	
Assessment	0-5, assigments	
Course Material	Handouts	

BK80A2000	*BASICS OF TECHNICAL MECHANICS*	*4 ECTS cr*
	Basics of Technical Mechanics **Belongs to only to complementary studies of New Packaging Solutions.**	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Tapani Halme	
Contents	Equilibrium of a particle and a rigid body, concentrated and distributed force systems, problems involving trusses, frames and machines. Internal forces of straight beams, centroid and main axes of a cross-section. Definition of normal and shear stress, mechanical properties of materials. Separate treatments of axial load, torsion and bending. State of stress resulting from combined loadings. Theories of failure, design of beams and shafts. Deflections of beams and shafts. Buckling of columns.	
Teaching Methods	Lectures 24 h Exercises 6 h Independent work 6 h	
Assessment	Passed/not passed based on exercises and exam, exam 50 %, exercises 50 %.	
Course Material	Hibbeler, Statics and Strength of Materials	

CS20A6000	*SUPPLY CHAIN MANAGEMENT*	*6 ECTS cr*
	Supply Chain Management, Toimitusketjun hallinta **Only for the students of the Master's degree programme "New Packaging Solutions".**	
Year and Period	M.Sc. (Tech.) 1, Period int.	
Lecturer(s)	Professor, D.Sc. (Tech.) Janne Huiskonen Assistant, N. N.	
Aims	Relevant supply chain concepts. Basic principles and methods for planning and control of material flows in supply chains. Understanding of inter-company effects and needs for cooordination and collaboration. Key performance indicators of supply chain management.	
Contents	The role and tasks of supply chain management (SCM) in a firm. Principles and	

	basic methods of planning and control of material flows in supply chain. Supply chain dynamics and coordination. Structural design of supply chains. Inter-company relationships and collaboration. Performance measurement.
Teaching Methods	Lectures, exercises and case assingments 28 h as intensive teaching in April to June. exercises and case assignments. Written examination. Accepted assignments.
Assessment	0-5. Examination and assignments.
Course Material	Literature will be announced later.

CS20A6050	***DECISION-MAKING IN SUPPLY CHAIN***	***5 ECTS cr***
	Decision-Making in Supply Chain , Päätöksenteko toimitusketjussa **Only for the students of the Master's degree programme "New Packaging Solutions".**	
Year and Period	M.Sc. (Tech.) 1, Period int.	
Lecturer(s)	Senior Assistant, M.Sc. (Tech.) Petri Niemi Assistant, N. N.	
Aims	Ability to manage strategic supply chain decision-making processes and support them with quantitative supply chain analysis techniques.	
Contents	Quantitative supply chain analysis techniques utilization in strategic supply chain decision-making process. Strategic supply chain decision-making as a process. Presentations for decision-making support.	
Teaching Methods	Lectures and group work guidance 26 h as intensive teaching in April to June. Accepted case assignments.	
Assessment	0-5. Case assignments oral presentations and written reports 100%.	
Course Material	Literature will be announced later.	
Prerequisites	CS20A6000 Supply Chain Management.	

CS30A6000	***TECHNOLOGY MANAGEMENT***	***3 ECTS cr***
	Technology Management, Teknologiajohtamisen perusteet **Only for the students of the Master's degree programme "New Packaging Solutions".**	
Year and Period	M.Sc. (Tech.) 1, Period int.	
Lecturer(s)	Researcher/Teacher, D.Sc. (Tech.) Ville Ojanen	
Contents	Must know: Sources and Areas of Industrial Innovation. Technology Management Taxonomies and Tools. Technology and Product Strategies. Innovation Management Taxonomies. From Idea to Product Process. Management of R&D and New Product Development Projects. Assessment Methods for Decision-making in Technology Management. New Technology-based Start-ups. Should know: Product Lifecycle Management. Marketing of New Products. Collaboration in Innovation and Technology Management. Special Issues, e.g. Intellectual Property Rights.	
Teaching Methods	Lectures and excercises 18 h as intensive teaching in April to June. Written examination and case study reports.	
Assessment	0-5, examination 70 %, written and oral case/research article reports 30 %.	
Course Material	Lecture notes. F. Betz: Managing Technological Innovation: Competitive Advantage from Change, 2nd edition (2003). Baker, Michael & Hart, Susan (1998): Product strategy and management. Prentice Hall. Articles and Case Studies Other literature announced later.	

CS35A6000	*INFORMATION & KNOWLEDGE MANAGEMENT IN INNOVATIVE ENTERPRISES* *6 ECTS cr*
	Information & Knowledge Management in Innovative Enterprises , Tietojohtaminen uudistuvassa yrityksessä **Only for the students of the Master's degree programme "New Packaging Solutions".**
Year and Period	M.Sc. (Tech.) 1, Period 4 int.
Lecturer(s)	Professor, D.Sc. (Tech.) Hannu Kärkkäinen Lecturer, M.Sc. (Tech.) Jorma Papinniemi
Aims	To clarify how various systematic approaches, tools and methods of information & knowledge management can be utilized as well in product innovation as in business process re-engineering to improve the innovativeness and competitiveness of enterprises.
Contents	Must know: Challenges, needed skills and systematic approaches for the development of new innovations. Process innovation and the role of IT. Management of process information and knowledge. Design of business processes. Automation of B2B processes. Should know: How people perceive, gather, select, organize and create information and knowledge for the development of novel types of innovations. Modeling tools in BPR. Process-aware information systems ERP,CRM,SCM,PLM).
Teaching Methods	Lectures 32 hrs as intensive teaching from April to June. Written seminar report and its presentation and opponent report.
Assessment	0 - 5, seminar report 70 %, presentation 10 %, opponent report 20 %.
Course Material	Selection of articles. Becker, Jörg et. al. editors: Process Management. A Guide for the Design of Business Processes. Springer-Verlag 2003.

10 Master's Degree Programme in Bioenergy Technology

The Master's degree programme in Bioenergy Technology corresponds to 120 ECTS credits and leads to the degree of Master of Science in Technology.

The Aims of the Master's Degree Programme

The Master's degree programme responds to the needs of the changing society regarding sustainable energy and environmental engineering in a socially responsible international context.

The graduate is expected to

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

The Structure of the Programme

Master's Thesis 30 ECTS cr	
Major Subject 30 ECTS cr	**Minor Subject min. 20 ECTS cr**
General Studies 24 ECTS cr	**Elective Studies min. 16 ECTS cr**

General Studies (24 ECTS credits):
General studies are common to all the students in the programme.

Major Subject (30 ECTS credits)
The major subject Environmental Energy Technology is common to all the students in the programme.

The major subject 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.

Master's Thesis (30 ECTS credits)
The Master's thesis is a demanding research or design project carried out in the field of student's major subject.

Minor Subject (20 ECTS credits)
Students can choose any minor subject taught in English at LUT.

The minor subject Bioenergy Technology consists of 23 ECTS credits.

Elective Studies
To attain the full 120 ECTS credits, the students need to take some additional courses. Elective studies can include any courses taught in English at LUT if the required prerequisites are completed.

General Studies

Obligatory Studies (24 ECTS cr)		*year*	*per.*	*ECTS cr*
BK10A0300	Introduction to M.Sc. Studies	M.Sc. (Tech.) 1	1	1
BM20A1900	Statistics II	M.Sc. (Tech.) 1-2	2	3
FV18A9100	Finnish for Foreigners 1		1, 3	2
FV18A9200	Finnish for Foreigners 2		2, 4	2
FV11A9000	Academic Seminar for International Programs		2–4	6
BM20A1300	Complex Analysis	M.Sc. (Tech.) 1-2	3	3
BM20A2700	Numerical Analysis II	M.Sc. (Tech.) 1	3	3
BM20A2800	Nonlinear Optimization	M.Sc. (Tech.) 1-2	4	4

Major Subject (60 ECTS cr)

Environmental Energy Technology

Obligatory Studies (60 ECTS cr)		*year*	*per.*	*ECTS cr*
BH60A2200	Air Pollution Control	M.Sc. (Tech.) 1	3-4	3
BH60A2400	Solid Waste Management reladed to energy production	M.Sc. (Tech.) 2	1-2	4
BH80G0000	Bioenergy	M.Sc. (Tech.) 1	1	3
BH80G0100	Bioenergy Technology Solutions	M.Sc. (Tech.) 1	2-3	6
BH40A1300	Power Engines in Renewable Energy	M.Sc. (Tech.) 2	2	5
BH50A1200	Energy Systems Engineering	M.Sc. (Tech.) 1	1-2	6
BH60A2000	Emission Trading	M.Sc. (Tech.) 1	3-4	3
Thesis	Master's Thesis			30

Minor Subject (23 ECTS cr)
Bioenergy Technology

Obligatory Studies (23 ECTS cr)		*year*	*per.*	*ECTS cr*
BH60A1600	Basic Course on Environmental Management and Economics	B.Sc. (Tech.) 2	1-2	5
BH60A2300	Waste Heat Recovery Techniques	M.Sc. (Tech.) 2	3-4	6
BH60A2500	Research Seminar	M.Sc. (Tech.) 2	3-4	2
BH50A1300	Maintenance Management	M.Sc. (Tech.) 2	1-2	4
BH50A1400	Steam Boilers	M.Sc. (Tech.) 1	3-4	6

Elective Studies

Elective Studies (min.16 ECTS credits should be selected to attain 120 ECTS credits)		*per.*	*op*
FV11A9300	Scientific and Technical English Writing Course	3–4	4
BL30A1200	Numerical Methods in Electromagnetism	3	4
CS10A0300	Business Forecasting	1	4
CS10A0850	Transitional Countries Integration with the European Union - Trade, Manufacturing and Labour Perspective	4	5
CS34A0500	Technology Commercialization and Corporate Venturing	4 int.	5

The Courses Offered in English

		ECTS cr
BH40A1300	Power Engines in Renewable Energy	5
BH50A1200	Energy Systems Engineering	6
BH50A1300	Maintenance Management	4
BH50A1400	Steam Boilers	6
BH60A1600	Basic Course on Environmental Management and Economics	5
BH60A2000	Emission Trading	3
BH60A2200	Air Pollution Control	3
BH60A2300	Waste Heat Recovery Techniques	6
BH60A2400	Solid Waste Management reladed to energy production	4
BH60A2500	Research Seminar	2
BH80G0000	Bioenergy	3
BH80G0100	Bioenergy Technology Solutions	6

Course Descriptions

BH40A1300	***POWER ENGINES IN RENEWABLE ENERGY 5 ECTS cr***
	Power Engines in Renewable Energy
Year and Period	M.Sc. (Tech.) 2, Period 2
Lecturer(s)	Professor, D.Sc. (Tech.) Jaakko Larjola Professor, D.Sc. (Tech.) Jari Backman Researcher/Teacher, D.Sc. (Tech.) Teemu Turunen-Saaresti
Aims	The course gives a comprehensive view on power engines on the market that can be used in bioenergy conversion.
Contents	Gas turbines, compressors, turbines, fuel cells, reciprocative engines.
Teaching Methods	Four combined lectures and tutorials, each 4 hours. The students are expected to study the Material Notebook and WebCT in advance to pass the required exercises and quizzes.
Assessment	0-5. The evaluation is based on the quizzes and final exam, which will be completed in the Exam Aquarium with WebCT. Extra points for approved (50%) performance in the quizzes and exercises.
Course Material	Material Notebook, WebCT course material: summary, exercises, quizzes.

BH50A1200	***ENERGY SYSTEMS ENGINEERING 6 ECTS cr***
	Energy Systems Engineering
Year and Period	M.Sc. (Tech.) 1, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Lasse Koskelainen
Aims	The course gives a comprehensive view towards different types of energy production processes. The course focuses on life cycle assessment in the planning and implementation phases of energy systems.
Contents	Fundamentals of engineering thermodynamics. Power plant engineering, combined heat and power production, combustion systems. Fundamentals of steam and gas turbines in power production. Control systems. Cost structure. Environmental impacts. Planning and implementation of energy systems.
Teaching Methods	Lectures and case exercises 14 h, 1st period, lectures and case exercises 14 h, 2nd period, written assignment, examination.
Assessment	0-5, written assignment 30%, examination 70%.

BH50A1300	MAINTENANCE MANAGEMENT	4 ECTS cr
	Maintenance Management	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Lasse Koskelainen	
Aims	The course gives a comprehensive view towards organising, planning and diagnosing maintenance especially in power plants.	
Contents	Terminology. Maintenance strategies and monitoring. Failure mechanisms and reliability. Organisation and functions of maintenance management. Preventive maintenance. Spare part management. Maintenance information systems.	
Teaching Methods	Lectures and case exercises 14 h, 1st period. Lectures and case exercises 6 h, 2nd period. Written assignment.	
Assessment	0-5, written assignment 30%, examination 70%.	

BH50A1400	STEAM BOILERS	6 ECTS cr
	Steam Boilers	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Professor, D.Sc. (Tech.) Lasse Koskelainen	
Aims	The course gives a comprehensive view towards steam boilers using different types of fuels. The course concentrates on boilers utilising biofuels.	
Contents	Characteristics of fuels. Combustion and gasification. Design of a steam boiler and its components. Operation and maintenance of boilers: Corrosion, Fouling, Emissions.	
Teaching Methods	Lectures and case exercises 14 h, 3rd period. Lectures and case exercises 14 h, 4th period. Written assignment, examination.	
Assessment	0-5, written assignment 30%, examination 70%.	

BH60A1600	BASIC COURSE ON ENVIRONMENTAL MANAGEMENT AND ECONOMICS	5 ECTS cr
	Basic Course on Environmental Management and Economics	
Year and Period	B.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	The aim of the course is to introduce students to the challenges that sustainable development poses to business and to the methods that control those challenges.	
Contents	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.	
Teaching Methods	Intensive course. Lectures 24 h, written assignment, 1st and/or 2nd period. Examination, WebCT.	
Assessment	0-5, examination 75%, written assignment 25%.	
Course Material	Literature will be announced later.	

BH60A2000	EMISSION TRADING	3 ECTS cr
	Emission Trading	
Year and Period	B.Sc. (Tech.) 3, Period 3-4	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen	
Aims	The goal of the course to provide students with the basics of different emission	

	trading schemes and their effects on idustry as well as consumers.
Contents	Topics include: greenhouse effect and climate change, the Kyoto protocol and Kyoto mechanisms, the EU emission trading scheme, the effect of EU emission trading on different industries.
Teaching Methods	Lectures 14 h, 3rd period. Assignment and seminars, 4th period. Examination. WebCT.
Assessment	0-5, examination 100%. An excellent assigment count for additional points for the exam.

BH60A2200	***AIR POLLUTION CONTROL***	***3 ECTS cr***
	Air Pollution Control	
Year and Period	M.Sc. (Tech.) 1, Period 3-4	
Lecturer(s)	Professor, D.Sc. (Tech.) Esa Marttila	
Aims	The course gives a comprehensive view towards different types of gas emissions and gas cleaning techniques. Appliance technology, and the design and manufacture of appliances are introduced.	
Contents	Gas emissions from combustion, industry and municipalities. Emission matter collection, treatment and recycling. Cleaning techniques: cyclones, electrostatic precipitators, fabric filters, scrubbers, incinerators, and adsorption.	
Teaching Methods	Lectures 8 h, seminar work and written assignment, written examination.	
Assessment	0-5, 75% exam, 25% seminar work and written assignment.	
Course Material	C. David Cooper, F.C. Alley: Air Pollution Control.	

BH60A2300	***WASTE HEAT RECOVERY TECHNIQUES***	***6 ECTS cr***
	Waste Heat Recovery Techniques	
Year and Period	M.Sc. (Tech.) 2, Period 3-4	
Lecturer(s)	Professor, D.Sc. (Tech.) Esa Marttila	
Aims	The course gives a comprehensive view towards different waste heat recovery techniques.	
Contents	Dimensioning the heat recovery heat exchanger. Recuperation ratio of a heat exchanger. Economic optimisation for cross flow gas-to-gas heat exchangers. Optimisation of a heat recovery unit in a ventilation system. Recuperative heat exchangers connected with stream flow.	
Teaching Methods	Lectures 12 h, seminar work, written assignment, written examination.	
Assessment	0-5, 75% exam, 25 % seminar work and written assignment.	
Course Material	Cource material will be announced during lectures.	

BH60A2400	***SOLID WASTE MANAGEMENT RELATED TO ENERGY PRODUCTION***	***4 ECTS cr***
	Solid Waste Management related to energy production	
Year and Period	M.Sc. (Tech.) 2, Period 1-2	
Lecturer(s)	Professor, D.Sc. (Tech.) Mika Horttanainen	
Aims	The course gives a comprehensive view on the waste-to-energy technologies and utilisation of by-products coming from energy production units.	
Contents	Waste-to-energy in Finland and other countries, properties of waste as a fuel, waste handling before thermal conversion, preparation of recycled fuel, mass combustion of waste, combustion of recycled fuel, gasification of waste, energy recovery in combustion of waste, emission reduction during combustion, flue gas treatment, utilisation and treatment of ash, utilisation and treatment of other flue gas residues, anaerobic digestion of waste, landfill gas utilisation in energy production.	

Teaching Methods	Lectures 14 h, exercises 14 h, 1 practical assignment, examination.
Assessment	Practical assignment 30%, exam 70%.
Course Material	Will be announced later.
Prerequisites	Basic knowledge on thermodynamics, chemistry and power plant technology.

BH60A2500	***RESEARCH SEMINAR***	***2 ECTS cr***
	Research Seminar	
Year and Period	M.Sc. (Tech.) 2, Period 3-4	
Lecturer(s)	Lecturer(s) responsible: Professor, D.Sc. (Tech.) Esa Marttila	
Contents	International students will present and defend their own thesis work, be opponents and follow other presentations.	
Teaching Methods	Seminars 8 h, 3rd period (2+3+3), project plan 10 h, prepare for presentation and act as an opponent. Seminars 9 h, 4th period (3+3+3), prepare for presentation and act as an opponent.	
Assessment	Pass/fail grade based on participation.	

BH80G0000	***BIOENERGY***	***3 ECTS cr***
	Bioenergy	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, D.Sc. (Tech.) Tapio Ranta	
Aims	The course gives a comprehensive view into the whole bioenergy chain – biofuel production, refining and end use. Students will gain an overview of the biofuel-based energy systems.	
Contents	The role of bioenergy in the EU energy policy, incentive programmes and future plans. Raw-material sources of bioenergy, resources and current use. Biomass supply systems and biofuel refining technologies, logistics and international trade. Quality control and standards. Biogas, solid and liquid biofuels.	
Teaching Methods	Lectures 14 h. Written examination.	
Assessment	Examination 100%.	
Course Material	Energy Visions 2030 for Finland, VTT Energy, 2001. Additional material will be announced later during lectures.	

BH80G0100	***BIOENERGY TECHNOLOGY SOLUTIONS***	***6 ECTS cr***
	Bioenergy Technology Solutions	
Year and Period	M.Sc. (Tech.) 1, Period 2-3	
Lecturer(s)	Professor, D.Sc. (Tech.) Tapio Ranta	
Aims	The course gives a detailed view into the technological solutions used in the bioenergy sector, the fuel production and bioenergy end-use technologies. Students will learn about the fundamental aspects of the technology for using biofuels in the energy system.	
Contents	Technological solutions and case studies from biomass supply and biofuel refining, end-use technologies of biofuels in different sectors.	
Teaching Methods	Lectures 14 h, study excursion. Teamwork assignment, seminar presentation. Written examination.	
Assessment	Examination 60%, teamwork assignment 40%.	
Course Material	Energy Visions 2030 for Finland, VTT Energy, 2001. Additional material will be announced later during lectures.	
Prerequisites	BH80G0000 Bioenergy	

11 Degrees in Business Administration

General Information

The following lower and higher university degrees can be obtained at the LUT, School of Business:

- Bachelor of Science (Economics and Business Administration) (B.Sc. (Econ. & Bus. Admin.)), workload 180 ECTS credits, duration approximately 3 years (=lower university degree)
- Master of Science (Economics and Business Administration) (M.Sc. (Econ. & Bus. Admin.)), workload 120 ECTS credits, duration approximately 2 years (=higher university degree)

Students complete the Bachelor's degree first and continue then to Master's degree studies.

In Master's degree programmes only the degree of Master of Science (Economics and Business Administration) is completed. Students admitted into Master's degree programmes are selected through a special application system.

Degree studies are completed in accordance with the Government Decree on University Degrees (794/2004) and the LUT Administrative Regulations on Teaching and Studying. The degree entered into force on 1 August 2005 and the LUT Administrative Regulations entered into force on 1st January 2007.

Study Modules
The B.Sc. (Econ. & Bus. Admin.) degree consists of the following study modules: general studies obligatory for all, basic and intermediate studies in the student's major subject, minor studies, language and communication studies and elective studies. Each study module has its own objectives, which determine the different forms of teaching applied.

The M.Sc. (Econ. & Bus. Admin.) degree consists of advanced studies, minor studies, language and communication studies and elective studies.

General Studies
General studies provide basic, general information regarding the field. They aim at providing an extensive basis for the degree, and the knowledge and skills required for other study modules. General studies are obligatory and required of all students.

Basic and Intermediate Studies
Basic and intermediate studies develop the student's scientific and professional knowledge and skills and concentrate on disciplines important for the major subject. Intermediate studies in the student's major subject include a Bachelor's thesis (10 ECTS credits) and a related maturity test.

Advanced Studies
Advanced studies develop previously acquired problem recognition and solving skills by integrating and applying knowledge. The student continues his or her specialisation in selected areas. Advanced studies in the student's major subject include a Master's thesis (30 ECTS credits) and a related maturity test.

Elective Studies
The degree also includes elective studies. The amount of elective studies depends on the student's individual study plan. Elective studies are included in the Bachelor's and Master's degrees in order to obtain the required 180 and 120 ECTS credits, respectively. Elective studies may include any

university-level courses, e.g. any courses given at LUT, including those in the field of technology or languages.

Course
A course is the basic unit of studies. It is an independent entity with specific learning outcomes. Courses included in the student's major subject are determined on the basis of the objectives and contents of the major subject. A course may include different forms of teaching and studying, such as literature, lectures, assignments, tutorials, independent research and combinations of the above. Courses can be obligatory, optional or elective in accordance with the curriculum.

Study Module
Major or minor subject study modules are composed of courses from one discipline or more. Each study module is on a specific, coherent topic or field.

Measurement of Studies
Studies are measured in credits, which indicate the input required for each course. 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.

Major Subjects and Learning Outcomes

At Lappeenranta University of Technology there are nine major subjects that lead to a Master's degree in Economics and Business Administration:

- Supply Management
- Management and Organizations
- International Marketing
- Accounting
- Finance
- Technology Research
- Knowledge Management
- Business Law
- International Technology and Innovation Management (an international master's degree program)

Supply Management
When modern businesses focus on their core know-how, they acquire more goods from outside and increasingly outsource services. Therefore, the importance of the management of supplies and external resources is emphasized as a success factor.

The aim of Supply Management is to provide students with the basic knowledge and skills required in supply planning and management in companies. The learning outcomes include the ability to manage challenges related to acquisitions in the corporate world. A supply management professional should understand the escalating internationalization and its demands with regard to international trade, and the possibilities opened up by electronic commerce. Flexible businesses that operate in the network economy require a new approach to supply relations. Supply management training provides a basis for logistics and supply management and professional tasks in different businesses in trade and industry and for teaching and research in the field.

Management and Organizations
Management and Organizations provides professional expertise in the management and development of a corporate organization from the human resources viewpoint. The subject especially focuses on human resource management and SME management. Entrepreneurship is also emphasized throughout the studies. In addition, the subject underlines knowledge of

organizational culture and values and its application as well as organizational psychology. Another objective is to give students theoretical and methodological knowledge and skills for research and postgraduate studies and for applying research results to the development of a company's activity.

Students of Management and Organizations find employment in various management tasks, e.g. consulting, which requires an understanding of the overall dynamics of business activity and administration, or management tasks in SMEs. The studies provide information on launching a business and developing internal entrepreneurship in large-scale business organizations. Due to the contents of the studies, employment in tasks requiring expertise in human resources and education is also possible.

International Marketing

The learning outcomes of International Marketing include the ability to work in tasks related to international business. The studies emphasise the marketing of high technology products and industrial products, international experience and extensive language skills. Some of the courses are in English and are sometimes given by international visiting lecturers.

A degree in International Marketing can include minor studies in not only business administration but also e.g. Industrial Engineering and Management or technology. The studies contain a great deal of practical assignments, case work and projects for companies. The curriculum also includes an obligatory student exchange period in one of the university's many cooperation universities abroad. The number of optional courses is rather high, which along with studies abroad contributes to a flexible and diverse study programme.

International Marketing graduates have extensive marketing know-how combined with technological expertise and international experience. Consequently, graduates have good possibilities to find employment in demanding tasks related to marketing and international business. Graduates have traditionally found positions in their own field of expertise.

Accounting

Major studies in Accounting provide students with the skills and knowledge to produce, analyse and utilise financial information needed in decision-making. In their studies, students may focus on management accounting (e.g. cost accounting, investment accounting, budgeting and financial management) or financial reporting (e.g. accounting, financial statement planning and analysis, taxation and auditing). Accounting studies are organized in cooperation with the Department of Industrial Engineering and Management. Minor studies in especially Business Law and Finance support major studies in Accounting. In addition to professional skills, major studies in Accounting provide skills and knowledge required in research and postgraduate studies.

Accounting graduates are usually employed in management positions and tasks requiring expertise in businesses and public organizations. They are often employed as accounting officers, financial directors, controllers, financial managers, management consultants, internal auditors and independent auditors. Those who have carried out their major studies in Accounting may also find work in various educational positions and as independent entrepreneurs in the field.

Finance

Major studies in Finance are a well coordinated combination of courses on corporate finance and investments. Courses on corporate finance include the following issues: corporate finance planning, investment accounting and decision-making, decision-making concerning capital structure and dividends and related effects. Courses on investments deal with e.g. financial markets and their activity, valuation models and processes of securities, management of an investment portfolio, pricing of derivative instruments and risk management.

The learning outcomes of the studies in Finance include sufficient, extensive and practical basic knowledge on all of the areas of finance and the competence for demanding professional tasks in the field in both Finland and abroad. The most potential employers are investment and commercial banks, brokerages, consulting and industrial companies, investment funds and insurance companies

and other investment services, general government, businesses involved in trade, and research and education institutes.

Technology Research
Students majoring in Technology Research start by carrying out intermediate studies in economics, where the impact of technological development plays a key role, and proceeding to advanced studied in Technology Research. This degree programme is unique in Finland, and its aim is to provide students with the ability to analyse the impact of technological development on the economy as well as on private companies. Emphasis is on processes through which technological development boosts the productivity of the economy and thereby the well-being of citizens. Special focus is on information as a special production factor and a source of innovation profit. Advanced studies concentrate on the analysis of micro-level mechanisms which help businesses organize their activity with the view to derive the maximum profit from their core know-how.

Knowledge Management
The Master's degree studies in Knowledge Management provide the tools to respond to the challenges of the technological transition and global competition. Converting organizational knowledge and expertise into financial value is considered the most important source of competitive edge. The aim of the Knowledge Management degree programme is to train professionals and leaders who can combine business skills, intellectual capital and information technology into a competitive edge for a company. The studies will also allow students to grasp how human resources can be utilized most efficiently in knowledge-intensive business. Students will also learn about the dynamics of a knowledge-intensive society and the importance of social capital in a global network economy. This degree programme is one of a kind in Finland, and the students will carry out minor studies in both Information Technology and Industrial Engineering and Management.

Business Law
Legislation has become increasingly important in the activity of businesses. The reliable management of legal risks is a prerequisite for efficient and cost-effective business activity.

Business Law covers the areas of law that are the most closely related to the economic activity of a company. The objective of the studies is to teach students to recognise and manage legal risks in business decision-making.
Students are taught to recognize and manage the legal risks involved in decision-making in business, such as concluding agreements, liabilities in a commercial transaction, selecting and using marketing and competition strategies, protecting industrial rights, decision-making and liabilities in different company forms, agreeing on the terms of an employment relationship, the credit and collateral investment functions in a company, and corporate tax planning.

Students majoring in Business Law acquire a solid understanding of the legal basis of a company's activity and the legislative tools for managing and controlling this activity. Minor subjects provide knowledge of the core areas of business administration education, which is a good combination with the extensive knowledge of legal issues acquired in the major subject.

Students who obtain their Master's degree in Business Law have good employment prospects in management positions or tasks requiring expertise in financial administration or human resources or the sales and marketing sector in trade and industry, depending on their minor studies. In addition, combined with certain continuing professional training these studies offer knowledge and skills for tasks that require expertise in auditing. Furthermore, the studies provide a basis for independent entrepreneurship.

Master´s Degree Program (CBU) in International Technology and Innovation Management (MITIM)

The new MITIM program is a result of cooperation between two business schools. Lappeenranta University of Technology, School of Business (LSB) and The Graduate School of Management (GSOM) of St. Petersburg State University.

The MITIM program is designed to give future managers the analytical and managerial skills necessary to succeed in the international business field of technology and innovations. Graduates are trained to understand the specifics of international business environments, cross-border movement of goods, people and technology, and the management of technologically oriented organizations in the global markets.

The MITIM program focuses on close cooperation between business education and the business community, integrating knowledge and best practices. All students will receive the unique opportunity to complete their summer internships in leading international technology oriented companies in Russia and Finland.

The program leads to the degree of Master of Science in Economics and Business Administration at Lappeenranta University of Technology, School of Business (LSB) and the degree of Master of Management at St. Petersburg State University, School of Management (GSOM).

Internship

Both the Bachelor's and Master's degree in Economics and Business Administration may include an optional or an obligatory internship worth a maximum of 5 ECTS credits. Two consecutive weeks of internship are worth one credit.

Advanced studies for students majoring in Management and Organizations include an obligatory internship worth 5 ECTS credits. In other major subjects, the internship is included in elective studies.

Before the internship begins, students must contact the professor in charge of the major subject to find out what kind of internship can be included in the degree. After the internship students prepare a report on the internship, what it was like and how it was connected with the studies. The report, an informal application for including the internship in the studies and a work certificate is submitted to the professor in charge of the subject or someone assigned by the professor, who will then decide on the inclusion.

Business Administration Degree Structure

Bachelor of Science (Economics and Business Administration) 180 ECTS credits

- Compulsory general studies (min. 60 ECTS cr)
- Language and communication studies (16-25 ECTS cr)
- Basic and intermediate studies in the major subject, including a Bachelor's thesis and a related maturity test (min. 60 ECTS cr)
- Minor studies (min. 25 ECTS cr)
- Elective studies (10-19 ECTS cr)

Master of Science (Economics and Business Administration) 120 ECTS credits

- Advanced studies in the major subject, including a Master's thesis and a related maturity test (min. 60 ECTS cr)
- Language and communication studies (11 ECTS cr)
- Minor studies (min. 25 ECTS cr)
- Elective studies (24 ECTS cr)

Important Information on Preparing an Individual Study Plan

- **<u>Important!</u> Either the B.Sc. or M.Sc. (Econ. & Bus.Adm.) degree must include one university-level minor subject in economics (= Accounting, Finance, Supply Management, Int. Marketing, Business Law, Management and Organizations, Knowledge Management, Economics, SME Development).**

- **In a minor subject students must first carry out basic studies before they can take intermediate studies.**

- In the B.Sc. (Econ. & Bus.Adm.) degree, part of the general studies will be transferred to the major studies where they will be included in the total number of credits. One course in general studies can only be included in one part of the study plan (e.g. Introduction to Accounting and Finance is transferred to the Accounting study module) This applies also to other studies.

- If you can not otherwise obtain the required number of credits (180/120), you need to include elective studies into your degree (any courses at LUT are acceptable, including language courses). The amount of elective studies depends on your individual study plan.

- **Further information on the degree structure is available in Finnish at http://www.lut.fi/kati/opiskelu_ohjeita.php**

- **Postgraduate degrees (Licentiate and Doctor of Science (Economics and Business Administration)) can only include courses that have not yet been included in the person's undergraduate degree.**

12 Master's Degree Program (CBU) in Business and Administration - *International Technology and Innovation Management (MITIM)*

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

The Master's degree program titled as "International Technology and Innovation Management", takes two years, corresponds to 120 ECTS credits and leads to the degrees of Master of Science in Economics and Business Administration at LSB and Master of Management at GSOM. Thus students admitted into the program receive a degree certificate from both universities. Three semesters include obligatory lectures and exercises, as well as a summer internship and essay and elective courses. The fourth semester is devoted to the Master's thesis. The language of tuition in the program is English. In the autumn of 2007 students will study at GSOM in St. Petersburg.

The Degree Structure

Master of Science in Economics and Business Administration

General Studies	6	*ECTS cr*
Major Subject	66	*ECTS cr*
Minor Subject	30	*ECTS cr*
Elective Studies	18	*ECTS cr*
Credits	*120 (min.)*	*ECTS cr*

Major Subject (66 ECTS cr)

International Technology and Innovation Management

All the courses are obligatory		*year*	*per.*	*ECTS cr*
AC60A0000	Cross-Cultural Management and Corporate Social Responsibility in the Information Age	M.Sc. 1	1-2	6
AC60A0050	Knowledge Management as a Theory and Practice	M.Sc. 1	1-2	6
AC60A0200	Supply and Innovation Management	M.Sc. 1	3-4	6
AC60A0250	International High Technology Marketing	M.Sc. 1	4	6
AC60A0300	Economics of Innovation and Intellectual Capital	M.Sc. 1	4	6
	Technology Management	M.Sc. 2	1-2	6
Thesis	Master's Thesis	M.Sc. 2	3-4	30

Minor Subject (30 ECTS cr)

Business Administration in CBU

All the courses are obligatory		*year*	*per.*	*ECTS cr*
AB30A0550	International Financial Management	M.Sc. 1	3	6
AC60A0150	Strategic Management of Growth	M.Sc. 1	3	6
AC60A5000	Managerial Economics	M.Sc. 1	1-2	6
AC60A5050	International Economics and Trade	M.Sc. 1	1-2	6
	Summer Internship + Essay	M.Sc. 2		6

General Studies (6 ECTS cr)

AC60A0100	Qualitative and Quantitative Methods for Business Research	M.Sc. 1	1-2	6

Elective Studies (18 ECTS cr)

Min. 18 ECTS credits should be selected from GSOM or LSB or from other co-operation universities

Electives from GSOM		*year*	*per.*	*ECTS cr*
	Concepts of Contemporary Management	M.Sc. 2		6
	Business-Government Relations	M.Sc. 2		6
	Business in EU	M.Sc. 2		6
	Crisis Management in International Business	M.Sc. 2		6
	Service Marketing	M.Sc. 2		6
	Relationship Marketing and Network Approach in Marketing	M.Sc. 2		5
	Marketing Communications	M.Sc. 2		5
	International Business Ethics	M.Sc. 2		5
	International Retail Management	M.Sc. 2		5
	IT Management	M.Sc. 2		5

Electives from LSB		*year*	*per.*	*ECTS cr*
AB30A0400	Venture Capital and Private Equity Investing	M.Sc. 2		4
AB30A0600	Empirical Research in Accounting and Finance	M.Sc. 2	3-4	7
AC40A0100	Cross-Cultural Marketing Strategies	M.Sc. 2	2	5
AC40A0150	Integrated Marketing Communication	M.Sc. 2	4	5
AC40A0200	Internationalization of the Firm	M.Sc. 2	2	5
AC40A0650	International Business Strategies	M.Sc. 2	1-2	5
AC50AJ200	Collaborative Innovation and Innovativeness	M.Sc. 2	3	7
AC60A0350	Multivariate and Econometric Analysis Methods	M.Sc. 2	1-2	6
AC60A0400	International Accounting and Analysis	M.Sc. 2	1 / 2	6
CS10A0600	Doing Business in Transitional Economies	M.Sc. 2	3-4	7

Additional Information

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

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

Contact Information
Program Coordinator:
Professor, Ph. D. Minna Martikainen (**minna.martikainen@lut.fi**), program content

International Officer:
Minna Ranta (room 7385.1, **minna.u.ranta@lut.fi),** practical issues

Program web pages: http://www.lut.fi/kati/lsb/

The Courses Offered in English

		ECTS cr
AB30A0400	Venture Capital and Private Equity Investing	4
AB30A0550	International Financial Management	6
AB30A0600	Empirical Research in Accounting and Finance	7
AC40A0100	Cross-Cultural Marketing Strategies	5
AC40A0150	Integrated Marketing Communication	5
AC40A0200	Internationalization of the Firm	5
AC40A0650	International Business Strategies	5
AC60A0000	Cross-Cultural Management and Corporate Social Responsibility in the Information Age	6
AC60A0050	Knowledge Management as a Theory and Practice	6
AC60A0100	Qualitative and Quantitative Methods for Business Research	6
AC60A0150	Strategic Management of Growth	6
AC60A0200	Supply and Innovation Management	6
AC60A0250	International High Technology Marketing	6
AC60A0300	Economics of Innovation and Intellectual Capital	6
AC60A0350	Multivariate and Econometric Analysis Methods	6
AC60A0400	International Accounting and Analysis	6
AC60A5000	Managerial Economics	6
AC60A5050	International Economics and Trade	6
CS10A0600	Doing Business in Transitional Economies	7

Course Descriptions

AB30A0400	***VENTURE CAPITAL AND PRIVATE EQUITY INVESTING 4 ECTS cr***
	Venture Capital and Private Equity Investing **Lectured intensively every other year. Next time during the academic year 2008-2009. The language of teaching is English.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period Spring
Lecturer(s)	LL. Lic. Jari Lauriala Lecturer(s) responsible: Professor, D.Sc. (Econ. & Bus. Adm.) Eero Pätäri
Aims	The objective of the course is to give the participants an understanding of the key areas of VC and PE investing through lectures and real life cases that are solved in small groups and presented and discussed during seminar sessions.
Contents	The course introduces fund structures (limited partnerships), the investment process, due diligence, valuation, instrumentation of debt and equity, formulating and drafting investment agreements, exit strategy and risk management throughout the investment cycle.
Teaching Methods	Intensive lecturing 18 h + case exercises. Exam. Elective M.Sc. course in Finance. Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	Graded 0–5 on the basis of a written exam and case exercises.
Course Material	1. Lauriala, Jari: Pääomasijoittaminen, Edita, 2004. 2. Gladstone, David - Gladstone, Laura: Venture Capital Handbook: An Entrepreneur´s Guide to Raising Venture Capital, 1988 or newer edition, selected parts. 3. Gladstone, David - Gladstone, Laura: Venture Capital Investing: The Complete Handbook for Investing in Private Businesses for Outstanding Profits, 2003 or newer edition, selected parts. 4. Handouts in the class and all additional material required by the lecturer.
Prerequisites	B.Sc. studies in Finance (except Bachelor's thesis).

AB30A0550	*INTERNATIONAL FINANCIAL MANAGEMENT 6 ECTS cr*
	International Financial Management
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen
Aims	The aim of the course is to provide an analytic framework for understanding how cross-border financing, valuation, risk management, and investment decisions are influenced by a variety of factors including exchange rates, legislation, international tax considerations and country risks. The course provides an understanding of how firms can create, measure, and sustain value across borders.
Contents	The course consists of the four areas of international financial management. The part including currencies and asset prices concentrates on the mechanisms of exchange rates. The area of multinational financial decision making considers several of the central financial decisions multinational firms must make. The part of cross-border valuation and financing considers how the valuation and financing decisions must be modified in a cross-border setting. The Institutions and Finance part discusses investors' behavior and risk management.
Teaching Methods	Lectures 24 h, 3rd period. Course work (Assignment on a topic of mutual agreement which can be written individually or in groups of up to three members). Exam. Obligatory course in the Master's Degree Program (CBU) in Business and Administration. Elective advanced course in Finance.
Assessment	Graded 0–5 based 80% on an exam and 20% on course work.
Course Material	1. Madura, J., International Financial Management, 8th edition, or later version 2. Handouts in the class and all additional material required by the lecturer.
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor's thesis)

AB30A0600	*EMPIRICAL RESEARCH IN ACCOUNTING AND FINANCE 7 ECTS cr*
	Empirical Research in Accounting and Finance
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4
Lecturer(s)	Professor N.N.
Aims	The course has the following three objectives. First, the course provides an overview of recent relevant research issues in accounting and finance, thereby extending and deepening students' knowledge in the area of accounting and finance. The second aim of the course is to get students to think actively and critically about research, and third, the course is intended to prepare students for empirical research in accounting and finance.
Contents	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.
Teaching Methods	Lectures/seminar 21 h. Over the course of the term there will be two to three assignments, such as an article analysis or a referee report. The aim of these assignments is to get students to think actively and critically about research. The main course requirement is to write a term paper from the area of accounting or finance containing at minimum a detailed well-developed research proposal. Elective advanced course in Accounting and in Finance. Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	Graded 0–5 on the basis of the term paper.
Course Material	There is no textbook. Issues covered in class will be based on research papers and articles.

Prerequisites	Compulsory B.Sc. courses in Accounting or in Finance (except Bachelor's thesis). AB40A0000 Tilastollisen analyysin perusteet (Basic Course in Statistical Analysis Method) and AB40A0100 Monimuuttujamenetelmät (Multivariate Analysis Methods or Ka6710100 Quantitative Research Methods I)

AC40A0100	***CROSS-CULTURAL MARKETING STRATEGIES 5 ECTS cr***
	Cross-Cultural Marketing Strategies
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 2
Lecturer(s)	Researcher/Teacher, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	To familiarize the students with the factors in the cultural environment of business and to help them understand how these factors affect international marketing strategies.
Contents	Central concepts in understanding culture and its role in business: dimensions and categorizations of culture, sense of time and space, communication and negotiation styles. Understanding the effects of globalization on culture. Using cultural concepts to analyze how firms adapt their marketing strategies to foreign cultures.
Teaching Methods	10 hours of lectures, group assignments, oral group exam, term paper. Obligatory course in International Marketing basic studies. Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	0-5, Oral group exam 40%, term paper 40%, case report 20%.
Course Material	1. Selected chapters of Usunier (2000): Marketing Across Cultures, Prentice Hall. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet

AC40A0150	***INTEGRATED MARKETING COMMUNICATION 5 ECTS cr***
	Integrated Marketing Communication
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 4
Lecturer(s)	Researcher/Teacher, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	To familiarize the student with the concept and process of marketing communication. To give the students basic skills in the design, implementation and management of communication as part of the marketing process.
Contents	The role of marketing communication in the marketing strategy of an enterprise. The concept and implementation of integrated marketing communication. The design, implementation and management of advertising, sales promotion and public relations. The introduction of electronic and print media, media choice, the creative process and execution of a promotion campaign. The services in campaign planning, the advertising business and the advertiser-agency relationship. Legal and ethical issues in advertising. The course focuses especially on mass communication because there is a separate course available in personal selling and sales management.
Teaching Methods	28 hours of lectures, 14 hours of exercises, groupwork and an individual ad analysis report, 4th period. Written exam. Obligatory intermediate course in International Marketing. Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	0-5, written exam 50%, individual ad analysis 30%, groupwork 20%.
Course Material	1. Percy, Rossiter & Elliott (2001): Strategic Advertising Management, Oxford University Press. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet, CS10A0000 Markkinoinnin peruskurssi or Ka6720000 Markkinoinnin ja hankintatoimen perusteet

AC40A0200	*INTERNATIONALIZATION OF THE FIRM* *5 ECTS cr*
	Internationalization of the Firm **All instruction will be in English.**
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 2
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo, Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Mika Ruokonen
Aims	To familiarize the students with the characteristics of the international market environment and theories of internationalization. To provide strategic views on market choice and market entry.
Contents	Internationalization theories: e.g. the Uppsala model. The Network Model and Born Globals. Growth strategies of the firm. Characteristics and risks of the international economic, political and sociocultural environment. International market selection process and market entry modes. Implementation and coordination of an international marketing program with supporting market research and analyses.
Teaching Methods	21 hours of lectures and 14 hours of practical exercises. Obligatory intermediate course in International Marketing. Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	0-5 Active class participation. Exercises: oral and written project reports (30% of final grade). A written final examination (70% of final grade).
Course Material	1. Hollensen, S.: Global Marketing – A Decision-oriented approach, 2004. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet. AC40A0050 Vienti- ja tuontitoiminta is recommended.

AC40A0650	*INTERNATIONAL BUSINESS STRATEGIES* *5 ECTS cr*
	International Business Strategies **The course will be lectured for the first time in 2008-2009.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1-2
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen, Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen
Aims	The aim of the course is to familiarize the students with strategic planning for international business in general and the management and execution of international business strategies within the context of multinational corporations in particular. To help the students to develop an understanding of various international or global strategies and their advantages and disadvantages. The assignment aims to expose the students to actual management challenges in an international context.
Contents	International business planning. International and global business strategies. Strategic tools for analyzing the internal and external environment, for example resource and product positions. Organization of resources and capabilities within a multinational corporation. Implementation of an international business strategy.
Teaching Methods	14 h of interactive lectures, 1st period. 14 h of interactive lectures, 2nd period. Group assignment/project work. Exam. Obligatory advanced course in International Marketing. Elective course in the Master's Degree Programme (CBU) in Business and Administration.

Assessment	0-5. Active class participation. Assignment: oral and written project work, 80%. Exam (has to be passed), 20%.
Course Material	Assigned reading.
Prerequisites	Basic understanding of international business.

AC60A0000	***CROSS-CULTURAL MANAGEMENT AND CORPORATE SOCIAL RESPONSIBILITY IN THE INFORMATION AGE*** ***6 ECTS cr***
	Cross-Cultural Management and Corporate Social Responsibility in the Information Age **Only for the students of the Master's Degree Program (CBU) in Business and Administration. The course will be lectured at GSOM.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Janne Tienari Associate Professor, Dr. Yuri E. Blagov
Aims	The objective of the course is to present students with a theoretically and practically grounded understanding of how multinational firms operate. The course pays particular attention to questions related to managing and organizing a cross-cultural workforce. Course themes also include presentation skills, ethics and social responsibility, image building, and the use of management consultants in international business.
Contents	Session (1) Introductions, overview and organization of course work. Working across borders: presentation skills. How multinational firms function. Instructions for teamwork assignment 1. Session (2) Ethics and social responsibility in global business. Teamwork assignment presentations 1. Managing the cross-cultural firm: Image building. Instructions for teamwork assignment 2. Session (3) Ethical and responsible decision-making. Teamwork assignment presentations 2. Managing the cross-cultural firm: When cultures meet. Instructions for reading assignment. Instructions for case assignment. Session (4) Reading assignment seminar. Managing the cross-cultural firm: Using consultants. Session (5) Managing the cross-cultural firm: Focus on Russia and Finland. Session (6) Case assignment presentations. Course summary and preparation for the exam. Exam.
Teaching Methods	Lectures 6 X 3 hours. Teamwork assignments. Exam. Obligatory course in the Master’s Degree Program (CBU) in Business and Administration.
Assessment	0–5; exam 50% and assignments 50% of course grade.
Course Material	Available in the first course session.
Prerequisites	Basic knowledge of management and organizations.

AC60A0050	***KNOWLEDGE MANAGEMENT AS A THEORY AND PRACTICE*** ***6 ECTS cr***
	Knowledge Management as a Theory and Practice **Only for students of the Master's Degree Program (CBU) in Business and Administration. The course will be lectured at GSOM.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Kirsimarja Blomqvist

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

	Obligatory course in the Master's Degree Program (CBU) in Business and Administration.
Assessment	Students' work for the course will be assessed on 2 key aspects: group research paper and knowledge of the course topics (exam). The group project will be dedicated to the analysis of knowledge management practices in a particular company. Details of the group project assignment will be provided at the beginning of the course. The exam is a written test. It is based on all course issues and material. The final assessment is composed as follows: • Final exam – 60% • Student group project – 40%
Course Material	Compulsory reading: • A selection of up-to-date articles will be provided at the beginning of the course. Basic textbooks (these books are recommended solely as additional basic reading). • Davenport, T. and Prusak, L. Working Knowledge: How Corporations Manage What They Know. Boston: Harvard Business School Press. 1998. • Nonaka, I. and Takeuchi, H. The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford: Oxford University Press. 1995.
Prerequisites	None.

AC60A0100	***QUALITATIVE AND QUANTITATIVE METHODS FOR BUSINESS RESEARCH 6 ECTS cr***
	Qualitative and Quantitative Methods for Business Research **Only for the students of the Master's Degree Program (CBU) in Business and Administration. Course will be lectured at GSOM.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2
Lecturer(s)	Associate Professor, Dr. Irina Merkuryeva Professor, D.Sc. (Tech.) Kaisu Puumalainen
Aims	The objective of the course is to give the students an understanding of research process and methodology, especially in the context of international business research. The course provides the students with skills in the practical research design, analysis and reporting issues, especially in the context of cross-cultural studies. After the course the students should be able to: - understand the meaning of scientific research - write a research proposal - use databases to search for existing publications and empirical data - critically evaluate the research design and results of empirical studies - design an empirical study - evaluate the validity and reliability - recognize the main problems in cross-cultural studies - understand the applicability of the most typical qualitative and quantitative analysis methods
Contents	1) What is scientific research? Basic issues of the philosophy of science, research process, requirements for a Master's thesis 2) Using databases: finding research publications, introduction of secondary data sources available for SOM and LUT students 3) Qualitative methods 4) Quantitative methods: sampling, collecting secondary data, designing surveys (soliciting responses, analyzing non-response bias, survey data collection methods, questionnaire design, pre-testing, typical problems with survey data), reliability and validity, observational and experimental research designs, overview to the methods of analysis 5) Special challenges and issues in international business research: typical methods applied, main problems, role of culture in research design

	6) Reporting: Research proposal, conducting a literature review, reporting the methodology, presenting the results
Teaching Methods	Participation in lectures, 30 hours Evaluation of a research proposal and a Master's thesis Written exam based on the lectures and course books Obligatory course in Master's Degree Program (CBU) in Business and Administration.
Assessment	Evaluation of research proposal and master's thesis accepted vs. not accepted Written exam is graded from 0-5. The maximum points in the exam will be 50, and 25 points (50%) are required for passing the exam.
Course Material	1. Kumar, V. (2000) International marketing research. Upper Saddle River, NJ: Prentice-Hall 2. Cooper, D.R. & Schindler, P.S. (2001) Business Research Methods. New York: McGraw-Hill. Parts I – III (Chapters 1-14) 3. A book on qualitative research methods
Prerequisites	None

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

AC60A0200	***SUPPLY AND INNOVATION MANAGEMENT 6 ECTS cr***
	Supply and Innovation Management **Only for the students of the Master's Degree Program (CBU) in Business and Administration.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4
Lecturer(s)	Professor, D.Sc. (Tech.) Veli-Matti Virolainen Researcher/Teacher, D.Sc. (Tech.) Jukka Hallikas Professor N.N. (GSOM)
Aims	The objective of the course is to address the methods and frameworks for analyzing changing business models as a part of enterprise-wide supply and value networks. The aim is to deepen the understanding about the strategic role of supply management. It is designed to meet the requirements for using purchasing and supply management as a source of competitive advantage in organizations.

Contents	The course examines the structure and role of innovation management in complex supply/demand business systems. The course covers the following topics: inter-firm learning and change management, the principles of systems thinking, methods for assessing customer value, mapping of business processes and value streams, systematic innovation of business models, the role of technology in supply networks, and risk management of supply/demand processes. Purchasing and supply strategy as a part of a business strategy and issues of external resource management are covered during the course.
Teaching Methods	28 h of lectures and exercises in the 3rd and 4th periods. Obligatory course in the Master's Degree Program (CBU) in Business and Administration.
Assessment	Exam 0-5. Approved exercise reports.
Course Material	1. Hughes, J., Ralf, M., and Michels, B.: Transform Your Supply Chain. International Thomson Business Press, 240 p., 1998. 2. Cox, A.: Business Success. Earlsgate Press, 325 p., 1997. 3. Journal articles. Assigned reading (will be announced later).

AC60A0250	***INTERNATIONAL HIGH TECHNOLOGY MARKETING*** ***6 ECTS cr***
	International High Technology Marketing **Only for the students of the Master's Degree Program (CBU) in Business and Administration.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4
Lecturer(s)	Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen Associate Professor, Dr. Sergey P. Kouchtch Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen
Aims	The aim of the course is to provide students an understanding of high–technology marketing challenges and opportunities. To help the participants to understand the advantages and limitations of traditional marketing thinking and tools in emergent, international high technology markets. After the course, students will have skills to analyze the market environment and plan and organize marketing activities in international high-technology markets.
Contents	The course will include lectures, guest lectures, presentations, assignments and discussions on selected topics and practical problems. Current insights into challenges and opportunities in international high technology markets. The concepts of technology and ”high-tech”. Innovations and new products in high-tech markets. Industry structure, industry changes and marketing implications. Marketing research in international high-tech markets. Partnering. Entry timing. Strategic planning and marketing strategies in international high technology markets. Organizing marketing activities in international high-tech markets.
Teaching Methods	28 h of interactive lectures, 4th period Active participation. Independent and class assignments, project work. Exam. Obligatory course in the Master's Degree Program (CBU) in Business and Administration.
Assessment	0-5. Active class participation and assignments, including project work (40% of the final grade). Written exam (60% of the final grade). All assignments have to be passed.
Course Material	1. Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2005). Marketing of High-Technology Products and Innovations. Second Edition. Pearson Prentice Hall. 2. Assigned reading.

AC60A0300	*ECONOMICS OF INNOVATION AND INTELLECTUAL CAPITAL* *6 ECTS cr*
	Economics of Innovation and Intellectual Capital **Only for the students of the Master's Degree Program (CBU) in Business and Administration.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Kalevi Kyläheiko Associate Professor, Dr. Vasiliy K. Dermanov Professor, D.Sc. (Econ. & Bus. Adm.) Ari Jantunen Visiting lecturers
Aims	To familiarize students with basic concepts of the economics of innovation and intellectual capital, and provide an overview of theoretical perspectives on the economics of information goods, knowledge and innovation.
Contents	Knowledge-based economy, technological development and productivity, theoretical foundations and contemporary challenges of science and technology policies, innovation and competition, competitiveness of firms, profiting from innovation, pricing information goods, network externalities, economics of intellectual property rights, economics of innovation.
Teaching Methods	Lectures 28 h, 4the period. Exam. Obligatory course in the Master's Degree Program (CBU) in Business and Administration.
Assessment	0-5
Course Material	Assigned literature to be announced later.

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

AC60A0400	INTERNATIONAL ACCOUNTING AND ANALYSIS	6 ECTS cr
	International Accounting and Analysis **To be lectured during the academic year 2008-2009.**	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 2, Period 1/2	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Sanna Tilli Visiting lecturer	
Aims	The objective of the course is to enrich students' understanding of international accounting and financial reporting. Particular emphasis is on comparative and international aspects of accounting together with financial analysis. The objective of the course is also to instruct students how to interpret financial information and assess the performance and prospects of the firm and how to use financial statement information to prepare a valuation.	
Contents	The course provides students knowledge of the main international differences in financial accounting, harmonization, financial reporting by individual companies, international financial analysis, financial statement analysis, valuation, assessment of accounting quality and the link between accounting and finance.	
Teaching Methods	Lectures 28 h. Term paper, exam. Elective course in the Master's Degree Program (CBU) in Business and Administration.	
Assessment	Graded 0-5 on the basis of the exam (60%) and the term paper (40%).	
Course Material	1. Nobes and Parker: Comparative International Accounting, 2006 2. Penman: Financial Statement Analysis and Security Valuation, 2007	

AC60A5000	MANAGERIAL ECONOMICS	6 ECTS cr
	Managerial Economics **Only for the students of the Master's Degree Program (CBU) in Business and Administration. The course will be lectured at GSOM.**	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2	
Lecturer(s)	Senior Lecturer Ekaterina V. Sokolova Lecturer(s) responsible: Senior Lecturer Ekaterina V. Sokolova	
Aims	The course aims to introduce a practical approach to economics theory. It attempts to bridge the gap between purely analytical problems that intrigue many economic theorists and the day-to-day decisions that managers face. It includes analysis of different tools and approaches for managerial policy-making.	
Contents	The course covers the economic analysis for such concepts as cost, demand, profit, and competition. Students will also examine some theoretical points of industrial innovation and technological change, oligopoly and strategic behaviour, and international competitiveness.	
Teaching Methods	Lectures, discussions, presentations, case studies. Lectures 34 h. Seminars 17 h. Obligatory course in the Master's Degree Program (CBU) in Business and Administration.	
Assessment	Home assignments – 30% Mid-term exam – 10% Final exam – 60%	
Course Material	Nick Wilkinson: Managerial Economics, Cambridge University Press, 2005. E. Mansfield: Managerial Economics; W.W. Norton & Company, 1990.	
Prerequisites	Introductory microeconomics	

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

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
Lecturer(s)	Professor, Ph.D. Tauno Tiusanen Assistant, Anna Karhu
Aims	Students are able to evaluate the emerging markets and choose the right modes of operations in TEs.
Contents	Must know: Country profiles of European transitional economies (TEs). The communist legacy in TEs. Macro-economic framework of the transitional process. Post-communist region in the global economy. Risks and opportunities in the TE markets. Investment climate and foreign direct investment in the TEs. Should know: EU's enlargement process.
Teaching Methods	Lectures 42 h 3. period, exercises 14 h 3. period and 14 h 4. period.

Assessment	0-5, examination 50 %, exercises 25 %, research report 25 %.
Course Material	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: Transitional Economies and International Competitiveness, Northern Dimension Research Centre, Publication n:o 31, Lappeenranta University of Technology 2006. Tiusanen Tauno: Poland, the Largest New EU Country., Northern Dimension Research Centre, Publication n:o 4, Lappeenranta University of Technology 2004. Tiusanen Tauno: Development of the Russian Rouble - The Crisis of 1998 and Its Aftermath, Northern Dimension Research Centre, Publication n:o 3, Lappeenranta University of Technology 2003.
Prerequisites	CS10A0550 International Business Methods.

13 The International Business and Technology Management Programme IBTM

IBTM programme is a non-degree programme 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 deadline for application for the autumn semester / academic year is June 1 and November 1 for the spring semester.

More information on schedule and courses can be found at the following web site:
www.lut.fi/exchange

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

Autumn Semester 2007

August 29 – December 21

1st period/August 29 - October 26
2nd period/October 29 - December 21

Orientation Day, August 29

The Courses Offered in Autumn Semester

Subject to alterations

Course number, Course		*ECTS cr*
AB30A0200	Asset Pricing Theory and Portfolio Management	7
AB30A0300	International Finance and Emerging Markets	5
AB30A0350	Project Work in Finance	4
AB30A0500	Financial Econometrics	5
AC30A6000	Organizational Culture and Gender Aspects in Management	5
AC40A0100	Cross-Cultural Marketing Strategies	5
AC40A0200	Internationalization of the Firm	5
AC40A0400	Research in Marketing Seminar Course	5
AC40A0600	Services Marketing and Management	5
AC40A6000	Introduction to International Business and Planning	3
AC50A0050	Introduction to Knowledge Management, literature exam	4
CS10A0300	Business Forecasting	4
CS10A0550	International Business Methods	7
CS10A0650	Management of High-tech Enterprises and Innovations in Russia	5
CS10A0800	The Basics of Doing Business in Russia	5
CS10A7000	The Economies of the Baltic States	3
CS30A7000	Technology Management in Japan	3
CS30A7050	Technology, Values and Society	3
CS30A7100	Management of Technology	5
CS34A0400	Strategic Entrepreneurship in Age of Uncertainty	5
FV18A9900	Finnish Society and Culture	2

Course Descriptions for Autumn 2007

AB30A0200	*ASSET PRICING THEORY AND PORTFOLIO MANAGEMENT* *7 ECTS cr*
	Asset Pricing Theory and Portfolio Management **Language of teaching is English**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Mika Vaihekoski
Aims	This course represents advanced course on asset pricing and portfolio management. The aim is to deepen students' skills and knowledge in asset pricing theory and recent empirical studies.
Contents	Theoretical and empirical research on asset pricing theory, modern portfolio theory, interest rates, bonds, term structure, portfolio management and behavioral finance.
Teaching Methods	Lectures/seminar 24 h, 2. period. Exercises 14 h, 2. period. Term paper (In written form, paper is presented by students in the seminar). Home assignments. Exam. Compulsory advanced studies -level course in Finance. WebCT.
Assessment	Graded 0–5 on the based on 80% exam and 20% term paper. Bonus points available from the home assignments.
Course Material	1. Elton, Edwin J. et. al.: Modern Portfolio Theory and Investment Analysis, 2003 or newer. Selected parts. 2. Copeland, T., Weston, J. F. - Shastri, K.: Financial Theory and Corporate Policy, 2003 or newer. Selected parts. 3. Handouts in the class and all additional material required by the lecturer.
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor’s thesis)

AB30A0300	*INTERNATIONAL FINANCE AND EMERGING MARKETS* *5 ECTS cr*
	International Finance and Emerging Markets **Language of teaching is English.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Mika Vaihekoski, visiting lecturers
Aims	The aim of the course is to introduce international finance theory as well as to deepen student's knowledge of the special issues of corporate finance and asset pricing related to international finance. Furthermore, the course introduces various emerging markets and their special characteristics as well as deepens student's knowledge of the special issues of corporate finance and asset pricing related to emerging markets.
Contents	Foundations of international finance theory, asset pricing, foreign exchange rates, interest rates, international financial markets. Emerging financial markets. Especially markets in Russia. Recent development and future directions.
Teaching Methods	Lectures 21 h. Written term paper. Exam. Elective advanced studies -level course in Finance. WebCT.
Assessment	Graded 0-5 on the basis of the exam 80% and term paper 20%.
Course Material	1. Literature will be decided later 2. Reading package 3. Handouts in the class and all additional material required by the lecturer.
Prerequisites	Basic studies in Finance required except Bachelor’s thesis.

AB30A0350	*PROJECT WORK IN FINANCE*	*4 ECTS cr*
	Project Work in Finance	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-4	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Eero Pätäri	
Aims	To develop student's abilities to apply finance theory in practice to solve problems faced by companies.	
Contents	Learning and understanding client company's financial problem and presenting a solution to the problem.	
Teaching Methods	Written project report (20-30 pages). Students can choose freely the timing of project work. Professor's approval to the subject of the project has to be asked beforehand. Elective advanced studies -level course in Finance.	
Assessment	Graded 0-5 on the basis of written report.	
Prerequisites	B.Sc. studies in Finance (except Bachelor's thesis).	

AB30A0500	*FINANCIAL ECONOMETRICS*	*5 ECTS cr*
	Financial Econometrics	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1	
Lecturer(s)	Docent, Ph.D. (Psych) Tomi Seppälä	
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.	
Contents	Empirical tests of market efficiency, tests of asset pricing models, event studies, time series models, modeling volatility and correlation, co-integration analysis, maximum likelihood estimation.	
Teaching Methods	Lectures and exercises 24 h, 1. period. Exam. Elective advanced studies -level course in Finance.	
Assessment	Grade 0–5 based on exam 80% and home assignments 20%.	
Course Material	1. Brooks, Chris: Introductory econometrics for finance. Cambridge, 2002 or newer. 2. Other material required by the lecturer.	
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor's thesis).	

AC30A6000	*ORGANIZATIONAL CULTURE AND GENDER ASPECTS IN MANAGEMENT*	*5 ECTS cr*
	Organizational Culture and Gender Aspects in Management **Language of instruction is English**	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 2	
Lecturer(s)	Professor, Ph.D. Albert J. Mills, Saint Mary's University, Halifax Professor, D.Sc. (Econ. & Bus. Adm.), B.Soc.Sc. Iiris Aaltio	
Aims	Managers and other experts working in organizations need nowadays skills to work with the multiple questions related to gender equality. The course will provide students with understanding the interrelationships between organizational culture, management, and gendered practices at the workplace. The focus is in the question, how the managers will be able to identify, assess and address the organizational processes that lead to discriminatory outcomes for women and men at work. Organizational cultures with multiple values and practices that both women and men find comfortable to work with are crucial for every modern organization.	
Contents	1. Understanding organizational culture. Its definition, discussion and methods of analysis. 2. Gender and organizational culture. An overview of an organizational culture approach to understanding the development of discriminatory practices of men	

	and women in the corporation. 3. Examination of selected issues to be drawn from corporate image-making, communication, structure, organizational rules, discourse analysis, group dynamics and interpersonal relations, studied in relation to the questions about gendered practices in the organization. 4. Equality practices in Finland. 5. Managing gender at work - issues and debates.
Teaching Methods	Intensive course (November 26 - 30). 24 hours of lectures, case exercises and group work. An important element of the course will involve small groups of 3-4 students analyzing and discussing assigned cases.
Assessment	Graded 0-5 on the basis of active class participation and group reports
Course Material	Articles, book chapters and cases to be specified by the lecturers and read before the course
Prerequisites	Basic courses in Human Resource Management advisable

AC40A0100	***CROSS-CULTURAL MARKETING STRATEGIES 5 ECTS cr***
	Cross-Cultural Marketing Strategies
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 2
Lecturer(s)	Researcher/Teacher, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	To familiarize the students with the factors in the cultural environment of business and to help them understand how these factors affect international marketing strategies.
Contents	Central concepts in understanding culture and its role in business: dimensions and categorizations of culture, sense of time and space, communication and negotiation styles. Understanding the effects of globalization on culture. Using cultural concepts to analyze how firms adapt their marketing strategies to foreign cultures.
Teaching Methods	10 hours of lectures, group assignments, oral group exam, term paper. Obligatory course in International Marketing basic studies. Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	0-5, Oral group exam 40%, term paper 40%, case report 20%.
Course Material	1. Selected chapters of Usunier (2000): Marketing Across Cultures, Prentice Hall. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet

AC40A0200	***INTERNATIONALIZATION OF THE FIRM 5 ECTS cr***
	Internationalization of the Firm **All instruction will be in English.**
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 2
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo, Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Mika Ruokonen
Aims	To familiarize the students with the characteristics of the international market environment and theories of internationalization. To provide strategic views on market choice and market entry.
Contents	Internationalization theories: e.g. the Uppsala model. The Network Model and Born Globals. Growth strategies of the firm. Characteristics and risks of the international economic, political and sociocultural environment. International market selection process and market entry modes. Implementation and coordination of an international marketing program with supporting market research and analyses.
Teaching Methods	21 hours of lectures and 14 hours of practical exercises. Obligatory intermediate course in International Marketing.

	Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	0-5 Active class participation. Exercises: oral and written project reports (30% of final grade). A written final examination (70% of final grade).
Course Material	1. Hollensen, S.: Global Marketing – A Decision-oriented approach, 2004. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet or Ka6720000 Markkinoinnin ja hankintatoimen perusteet. AC40A0050 Vienti- ja tuontitoiminta is recommended.

AC40A0400	***RESEARCH IN MARKETING SEMINAR COURSE 5 ECTS cr***
	Research in Marketing Seminar Course **The number of students attending the course may have to be limited based on pre-exam if the number of students exceeds 30. In registration priority is given to LUT master's students.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2
Lecturer(s)	Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen
Aims	To familiarize the students with the scientific writing: writing process, finding references and analyzing their quality. To learn the basics of scientific critique. To provide the students with knowledge and skills to formulate, analyze and critically evaluate scientific research. To familiarize students with marketing classics (theories and research).
Contents	Lectures on conducting the literature review and doing scientific research. Scientific writing skills. Analytical thinking. Finding research gap. Also the latest developments and the classics in international marketing, e.g. buyer behavior, competitive advantages, innovation management, e-business strategies, business models, internationalization models.
Teaching Methods	Pre-exam. 8 h of lectures in the 1st period. 16 h of seminar working in the 2nd period. Active participation, analyzing and preparing for assignments, written report, oral presentation, written evaluations of other students' research projects. Obligatory course in International Marketing advanced studies.
Assessment	0-5, Research project 40%, Extended research proposal 15%, Participation 15%, Presentation 15%, and Evaluations 15%
Course Material	Assigned reading.
Prerequisites	Basic knowledge of international marketing

AC40A0600	***SERVICES MARKETING AND MANAGEMENT 5 ECTS cr***
	Services Marketing and Management **The course will be arranged for the last time in 2007-2008.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-2
Lecturer(s)	N. N., Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Hanna Salojärvi
Aims	To familiarize the students with the concept of service and special characteristics of services in today's marketing and service competition. To provide the students with understanding of the role and importance of relationship marketing and customer relationship management (CRM) in marketing and management of services. To provide the students with strategic views on integration of a deep customer focus and knowledge across the organization. To familiarize the students with the challenges of services marketing and management in international markets.
Contents	Special characteristics of services and service quality, customer expectations

	and perception of services, relationship marketing and customer relationship management (CRM), internal marketing and management of service culture, characteristics of relationship-driven organization.
Teaching Methods	2 h of lectures, 1. period. 6 h of lectures including some group work, 2. period. A written term-paper and written examination.
Assessment	0-5, Written examination 70% of the final grade. Evaluation of the term paper: 30% of the final grade.
Course Material	1. Zeithaml, Valarie A, Mary Jo Bitner and Wayne D. Gremler, 2005. Services Marketing, Integrating Customer Focus Across the Firm. 4rd (or 3rd) edition. McGraw-Hill. 2. Grönroos, Christian, 2000. Service Management and Marketing. A Customer Relationship Management Approach. England: John Wiley & Sons. 3. Fitzsimmons, James A. & Fitzsimmons, Mona J., 2004. Service Management: Operations, Strategy, and Information Technology. International edition. 4th edition. McGraw – Hill
Prerequisites	Basic knowledge in marketing.

AC40A6000	***INTRODUCTION TO INTERNATIONAL BUSINESS AND PLANNING*** ***3 ECTS cr***
	Introduction to International Business and Planning **Language of instruction is English**
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2-3, Period 1
Lecturer(s)	D.Sc. (Econ.) Toivo S. Äijö, Top Trainers Group
Aims	To familiarize the students with the fundamentals of international business in general and strategic planning for international business in particular, as well as to provide the students with the analytical skills required for critical evaluation of actual international business strategies.
Contents	The global environment and its effects on international business and strategies. Latest challenges and ideas in international business. The role and importance of competitive advantage and core competence in strategy formulation. The strategic planning system for international business: the scope, time frame and organization. The contents of the strategic plan for international marketing.
Teaching Methods	Intensive course (September 6-7 & 12-14). 25 hours of lectures and case exercises.
Assessment	Graded 0-5 on the basis of case studies and a written examination
Course Material	1. James Taggart – Michael McDermott: The Essence of International Business, Prentice-Hall 1993 2. Other material will be announced during lectures
Prerequisites	Basic course in marketing

AC50A0050	***INTRODUCTION TO KNOWLEDGE MANAGEMENT, LITERATURE EXAM*** ***4 ECTS cr***
	Introduction to Knowledge Management, literature exam **No WebOodi registrations. The exam will take place in the Origo exam aquarium. Students will book their individual times for the exam using the exam aquarium application: http://www.lut.fi/fi/oppimiskeskus/origo/tenttiakvaario.html Master program of Knowledge management supplementary studies.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-4
Lecturer(s)	Researcher/Teacher, D.Sc. (Econ. & Bus. Adm.) Hanna-Kaisa Ellonen
Aims	To gain an overall view of knowledge management, to understand key elements of knowledge management and the related functional principles and tools and their application in practise.

Contents	Key concepts, models, and tools of knowledge management and their applications.
Teaching Methods	Independent study of assigned literature and a written exam (Origo exam aquarium).
Assessment	0-5, exam 100%
Course Material	1. Newell et al. (2002). Managing Knowledge Work. Palgrave MacMillan, New York. 207 s. 2. Dalkir, Kimiz (2005). Knowledge Management in Theory and Practice. Elsevier, 350 s.

CS10A0300	***BUSINESS FORECASTING***	***4 ECTS cr***
	Business Forecasting, Ennustetoiminnot johdon päätöksenteossa	
Year and Period	M.Sc. (Tech.) 1, Period 1	
Lecturer(s)	Professor, Lic.Sc. (Econ. & Bus. Adm.) Seppo Pitkänen Assistant, N. N.	
Aims	Ability to predict by conventional quantitative methods, and knowing the possibilities of the other approaches.	
Contents	Must know: Forecasts´ role in business planning and decision making. The foundations of statistico-empirical, intuitive, qualitative-structural and simulation forecasting methods at the practical level. Should know: Special issues on cross-impact analysis. Nice to know: Combination of quantitative and qualitative methods.	
Teaching Methods	Lectures 28 h, exercises 14 h 1. period.	
Assessment	0-5, examination 80 - 100 %, exercise report 0 - 20 %.	
Course Material	Will be distributed to the participants.	
Prerequisites	Basic skills in statistics (hypotesis testing, etc.), matrix algebra and elementary differential calculus. Recommended: A course dealing with economis/business decision making, or marketing research.	

CS10A0550	***INTERNATIONAL BUSINESS METHODS***	***7 ECTS cr***
	International Business Methods, Kansainvälisen liiketoiminnan menetelmät	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	Professor, Ph.D. Tauno Tiusanen Assistant, Anna Karhu	
Aims	Students know the advantages and disadvantages of different entry modes, and are able to evaluate risks and opportunities in the global markets.	
Contents	Must know: The course reviews the various trade theories and the usefulness of them in practice. It explores the main features of international trading and business relations since the Second World War. Various types of markets and methods to evaluate them will be discussed. Modes of international operations will be introduced; special attention will be paid to exporting, contractual arrangements and foreign direct investment (FDI). Theoretical approaches which explain international factor mobility are analysed and practical examples discussed. Different currency regimes will be discussed. Should know: Trade agreements between nations, risks in international business. Nice to know: International financial markets, cultural factors in international business.	
Teaching Methods	Lectures 42 h 1. period, excercises 14 h 1. period and 14 h 2. period.	
Assessment	0-5, examination 50 %, exercises 25 %, research report 25 %.	
Course Material	Lecture handouts. Taggart, James - McDermott, Michael C.: The Essence of International Business, London - New York 1993. Luostarinen, Reijo - Welch, Lawrence: International Business Operations.	

	Helsinki 1990.
Prerequisites	CS10A0050 Introduction to International Business .

CS10A0650	***MANAGEMENT OF HIGH-TECH ENTERPRISES AND INNOVATIONS IN RUSSIA 5 ECTS cr***
	Management of High-tech Enterprises and Innovations in Russia , Teknologiayritysten ja innovaatioiden johtaminen Venäjällä
Year and Period	M.Sc. (Tech.) 1-2
Lecturer(s)	Professor, M.Sc. (Tech.) Juha Väätänen
Aims	To know the state of high-tech sectors and innovations management in Russia.
Contents	Must know: Key issues of technology and innovation management in Russia. Russian high-tech sectors. Should know: Russian innovation environment. Decision making in Russia, cultural characteristics. Management transformation in state owned and private companies. Nice to know: Managerial comparison between Russia and western countries in high-tech sectors. Transition of leadership and management in different business sectors.
Teaching Methods	Literature exam.
Assessment	0-5, examination.
Course Material	Nevens, Michael T., Summe, Gregory L., and Uttal, Bro (1990). "Commercializing Technology: What the Best Companies Do." Harvard Business Review May-June 1990: 154-163. Easingwood, Chris, Moxey, Steven, and Capleton, Henry (2006). "Bringing High Technology to Market: Successful Strategies Employed in the Worldwide Software Industry." The Journal of Product Innovation Management 23:498-511 Bingham, Peter (2003). "Pursuing Innovation in a Big Organization." Research Technology Management 46(4): 52-58. OECD (2005). Fostering Public-Private Partnership for innovation in Russia. OECD. ISBN 92-64-00965-5. Gianella, C., and W. Tompson (2007). "Stimulating Innovation in Russia: The Role of Institutions and Policies", OECD Economics Department Working Papers, No. 539, OECD Publishing. Fey, Carl F., Adaeva, Margarita, and Vitkovskaia, Anastasia (2001). "Developing a Model of Leadership Styles: What Works Best in Russia?" International Business Review 10: 615-643. Ivanova, Oksana, Kyrki, Anna, Selioukova, Yana, and Väätänen, Juha (2005). Case Study on Software Development Company –Opportunities and Challenges of Russian High-Tech Start-Up. Northern Dimension Research Centre, Publication 15, Lappeenranta University of Technology. Chesbrough, Henry (2003). "The Era of Open Innovation." MIT Sloan Management Review 44(3): 35-41.
Prerequisites	CS10A0800 The Basics of Doing Business in Russia.

CS10A0800	***THE BASICS OF DOING BUSINESS IN RUSSIA 5 ECTS cr***
	The Basics of Doing Business in Russia, Venäjän kaupan perusteet
Year and Period	B.Sc. (Tech.) 3, Period 2
Lecturer(s)	Professor, M.Sc. (Tech.) Juha Väätänen
Aims	To understand the special characteristics of Russian economy and society.
Contents	Must know: Transition of Russian society and business environment. Should know: Living standard analysis, competitive advantages, industrial sectors, foreign direct investment and Russian business culture. Nice to know: Russia's economic and political integration with the world economy.
Teaching Methods	Lectures 35 h, presentation 10 h, seminar work 40 h, 2nd period.

Assessment	0-5, examination.
Prerequisites	No prerequisites.

CS10A7000	***THE ECONOMIES OF THE BALTIC STATES 3 ECTS cr***
	The Economies of the Baltic States **Language of instruction is English**
Year and Period	M.Sc. (Tech.) 1, Period 2
Lecturer(s)	Professor, D.Sc. (Econ.) Alari Purju Tallinn University of Technology and Estonian Business School
Aims	To familiarize the students with the Baltic economies including historical background, present characteristics and future trends.
Contents	Economic development and structural changes in Estonia, Latvia and Lithuania. Transition to market economy. Comparison of developments with other East European countries. Framework for business (tax system, other regulations). Structure of foreign trade. Trade with the EU and the CIS. Export impediments of enterprises. Introduction to economic problems of enterprises. Case studies. Role of foreign direct investments (FDI). The cycle theory of FDI. Real and monetary integration with the EU. What are the main factors determining future development of the Baltic states?
Teaching Methods	Intensive course (October 29-30 and November 7-9). 20 hours of lectures and case studies.
Assessment	Graded 0-5 on the basis of active class participation, group case studies and an essay
Course Material	1. Nielsen, Jorgen Ulff-Moller, Erik Strojer Madsen, Kurt Pedersen, International Economics. The wealth of open nations. Berkshire: McGraw-Hill Book Company, First print 1994. 2. 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. 3. Case studies of enterprises, material http://www.hex.com/tallinn/riga/vilnius
Prerequisites	Basic courses in international economy and marketing

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.
Lecturer(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.
Contents	1. The role of technology management and its contribution to industrial development. 2. What is technology management? - the purpose of technology management - kind of technology - technology and management. 3. Technology management system in the innovation management - innovation management system - the function of technology management. 4. The characteristics of Japanese industry - the historical and cultural background of Japanese industry. - traditional culture and modern industry of Japan

	- causes of development of Japanese industry - an overview of technology management in Japan - the role of technology and its management in Japanese industry. - new dilemma of Japanese industry. 5. Aspects of technology management - R & D management - new product development and product improvement - management technology and its application - computer technology and industrial technology - production management and technology management. 6. Future problem on technology management.
Teaching Methods	16 hours of lectures and class discussions in English.
Assessment	0-5, active participation in classes and a written assignment.
Course Material	Written material will be distributed during lectures.
Prerequisites	Basic knowledge of management.

CS30A7050	***TECHNOLOGY, VALUES AND SOCIETY***	***3 ECTS cr***
	Technology, Values and Society, Tekniikka, arvot ja yhteiskunta	
Year and Period	M.Sc. (Tech.) 1, Period 1 int.	
Lecturer(s)	Professor, D.Sc. (Tech.) Jorma Heinonen	
Aims	The primary objective of the course is to introduce the students a wider view to technology including the contemporary thinking of technology management principles. The society views technology basically as a source of welfare and prosperity. This view will be put in perspective in presenting alternative approaches to technology evaluation. In that context issues related to values, moral philosophy as well as ethical studies about technology will be referred.	
Contents	The course will cover the up to date view on technology, its evolution and certain basic management issues. Philosophical aspects, ethical studies and moral principles concerning technology will be reviewed and discussed. The role of technology in society will be looked as a generator of social changes the consequences of which can be two kinds: 1. It can create new opportunities 2. It can create new problems for individuals and societies	
Teaching Methods	20 hours of lectures case exercises and reporting. The course relies much on group work dealing with cases.	
Assessment	0-5, active class participation, case work assignments and a written examination.	
Course Material	Written material will be distributed during lectures.	
Prerequisites	Basic knowledge in business or technology management.	

CS30A7100	***MANAGEMENT OF TECHNOLOGY***	***5 ECTS cr***
	Management of Technology **Language of instruction is English**	
Year and Period	M.Sc. (Tech.) 1, Period 1-2	
Lecturer(s)	D.Sc. (Tech.) Tuomo Kässi, Professor LUT/Department of Industrial Engineering and Management	
Aims	The course develops a basic understanding of the issues and methods for managing technology as a strategic resource. The major issues in R&D Management and the process of technological innovation are included.	
Contents	The course reviews basic ideas and concepts of strategic and operational technology management including: - The concept of strategy - Strategy alternatives - Management product systems - Management of innovation	

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

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

FV18A9900	***FINNISH SOCIETY AND CULTURE***	***2 ECTS cr***
	Finnish Society and Culture **Language of instruction is English**	
Year and Period	Period 1-2 and 3-4	
Lecturer(s)	Dr. Kalle Michelsen, Professor (Finnish History, Political Culture, Social and Economic System) M.A. Kristiina Korjonen-Kuusipuro, Reseacher (Finnish Culture) Dr. Mika Tonder, Senior lecturer, (Landscapes, mentalities)	
Aims	The aim of this course is to introduce Finland and South Karelia to foreign students. The course provides basic information of Finnish history (focusing on Karelia and Karelian issues) from 1809 to the present, culture (arts, architecture and landscape), political system and international issues as well as social and economic systems (demography, ethnic, regional, gender and equality issues, trade, industry, science and technology).	
Teaching Methods	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) Society (4 lectures) E) Economic Systems (2 lectures) F) Nature and Landscape (4 lectures) G) Exam (2 lectures)	
Assessment	Passed on the basis of participation 60% and a written examination 40%.	
Course Material	Portraying Finland. Facts and Insights. Otava 2005. (Available in the library)	

Spring Semester 2008

January 10 - May 16

3rd period/January 10 - March 7
4th period/March 10 - May 16

Orientation Day, January 10

The Courses Offered in Spring Semester

Subject to alterations

Course Number, Course		*ECTS cr*
AB30A0250	Theory of Corporate Finance	7
AB30A0350	Project Work in Finance	4
AB30A0550	International Financial Management	6
AB30A0600	Empirical Research in Accounting and Finance	7
AB40A0500	Innovation and Competitiveness	5
AC30A6050	Small and Medium Size Enterprise Management and Business Development	3
AC40A0150	Integrated Marketing Communication	5
AC40A0250	Sales Management and Personal Selling	5
AC40A0350	Corporate Social Responsibility	5
AC40A0450	High Technology Marketing	5
AC40A0500	Customer Relationship Management	5
AC40A0550	International Entrepreneurship	5
AC40A6050	Cross-Cultural Encounters	3
AC50A0050	Introduction to Knowledge Management, literature exam	4
AC50A0300	Organizational Learning and Competence Management	6
CS10A0050	Introduction to International Business	4
CS10A0600	Doing Business in Transitional Economies	7
CS10A0650	Management of High-tech Enterprises and Innovations in Russia	5
CS10A0750	Enterprises and Competition in Russia	5
CS10A0850	Transitional Countries Integration with the European Union - Trade, Manufacturing and Labour Perspective	5
CS10A7050	Business Environment in Transitional Economies	4
CS30A1500	Transportation Systems	5
CS34A0500	Technology Commercialization and Corporate Venturing	5
FV18A9900	Finnish Society and Culture	2

Course Descriptions for Spring 2008

AB30A0250	***THEORY OF CORPORATE FINANCE***	***7 ECTS cr***
	Theory of Corporate Finance	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen	
Aims	The course is providing advanced knowledge in the area of corporate finance. Latest relevant research in the area is incorporated taking to account the practical aspects of combining theoretical aspects to practice. Moreover, the focus is also to learn how to deepen the knowledge in some specific area with the help of research articles.	
Contents	Specific issues of corporate finance include dividends, valuation, mergers and acquisitions, listings, IPOs, ownership structures, corporate governance, asymmetric information and international finance.	
Teaching Methods	Lectures/seminar 21 h, 4. period. Term paper (In written form, paper is presented by students in the seminar). Exam.	

	Compulsory advanced studies -level course in Finance.
Assessment	Graded 0–5 on the based on 80% exam and 20% term paper
Course Material	1. Ross, S.A., Westerfield, R.W. – Jaffe, J.: Corporate Finance, 7th edition, selected parts 2. Copeland, T., Weston, J.F. - Shastri, K.: Financial Theory and Corporate Policy, 2003, selected parts. 3. Handouts in the class and all additional material required by the lecturer.
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor's thesis)

AB30A0350	***PROJECT WORK IN FINANCE***	***4 ECTS cr***
	Project Work in Finance	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-4	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Eero Pätäri	
Aims	To develop student's abilities to apply finance theory in practice to solve problems faced by companies.	
Contents	Learning and understanding client company's financial problem and presenting a solution to the problem.	
Teaching Methods	Written project report (20-30 pages). Students can choose freely the timing of project work. Professor's approval to the subject of the project has to be asked beforehand. Elective advanced studies -level course in Finance.	
Assessment	Graded 0-5 on the basis of written report.	
Prerequisites	B.Sc. studies in Finance (except Bachelor's thesis).	

AB30A0550	***INTERNATIONAL FINANCIAL MANAGEMENT***	***6 ECTS cr***
	International Financial Management	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Minna Martikainen	
Aims	The aim of the course is to provide an analytic framework for understanding how cross-border financing, valuation, risk management, and investment decisions are influenced by a variety of factors including exchange rates, legislation, international tax considerations and country risks. The course provides an understanding of how firms can create, measure, and sustain value across borders.	
Contents	The course consists of the four areas of international financial management. The part including currencies and asset prices concentrates on the mechanisms of exchange rates. The area of multinational financial decision making considers several of the central financial decisions multinational firms must make. The part of cross-border valuation and financing considers how the valuation and financing decisions must be modified in a cross-border setting. The Institutions and Finance part discusses investors' behavior and risk management.	
Teaching Methods	Lectures 24 h, 3rd period. Course work (Assignment on a topic of mutual agreement which can be written individually or in groups of up to three members). Exam. Obligatory course in the Master's Degree Program (CBU) in Business and Administration. Elective advanced course in Finance.	
Assessment	Graded 0–5 based 80% on an exam and 20% on course work.	
Course Material	1. Madura, J., International Financial Management, 8th edition, or later version 2. Handouts in the class and all additional material required by the lecturer.	
Prerequisites	Compulsory B.Sc. courses in Finance (except Bachelor's thesis)	

AB30A0600	*EMPIRICAL RESEARCH IN ACCOUNTING AND FINANCE*	*7 ECTS cr*
	Empirical Research in Accounting and Finance	
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4	
Lecturer(s)	Professor N.N.	
Aims	The course has the following three objectives. First, the course provides an overview of recent relevant research issues in accounting and finance, thereby extending and deepening students' knowledge in the area of accounting and finance. The second aim of the course is to get students to think actively and critically about research, and third, the course is intended to prepare students for empirical research in accounting and finance.	
Contents	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.	
Teaching Methods	Lectures/seminar 21 h. Over the course of the term there will be two to three assignments, such as an article analysis or a referee report. The aim of these assignments is to get students to think actively and critically about research. The main course requirement is to write a term paper from the area of accounting or finance containing at minimum a detailed well-developed research proposal. Elective advanced course in Accounting and in Finance. Elective course in the Master's Degree Programme (CBU) in Business and Administration.	
Assessment	Graded 0–5 on the basis of the term paper.	
Course Material	There is no textbook. Issues covered in class will be based on research papers and articles.	
Prerequisites	Compulsory B.Sc. courses in Accounting or in Finance (except Bachelor's thesis). AB40A0000 Tilastollisen analyysin perusteet (Basic Course in Statistical Analysis Method) and AB40A0100 Monimuuttujamenetelmät (Multivariate Analysis Methods or Ka6710100 Quantitative Research Methods I)	

AB40A0500	*INNOVATION AND COMPETITIVENESS*	*5 ECTS cr*
	Innovation and Competitiveness	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 1-2, Period 3	
Lecturer(s)	Ph.D. Hannes Toivanen Lecturer(s) responsible: Professor, D.Sc. (Econ. & Bus. Adm.) Ari Jantunen	
Aims	This course explores the relationship between innovation and competitiveness of firms, industries, and nations. Assigned literature, lectures, and class work consider critical issues in competitive strategy and public policy. The course provides an accessible overview of major theoretical perspectives on innovation and key methods employed to measure and assess the impact of innovation.	
Contents	What is innovation, the innovation process and firm, industrial organization and innovation, national systems of innovation, measurement of innovation, special aspects of innovation, contemporary challenges of innovation.	
Teaching Methods	21 h of lectures. Exam. Obligatory course in Strategy Research subject studies.	
Assessment	0-5	
Course Material	Will be announced later, see web-pages.	

AC30A6050	*SMALL AND MEDIUM SIZE ENTERPRISE MANAGEMENT AND BUSINESS DEVELOPMENT* *3 ECTS cr*
	Small and Medium Size Enterprise Management and Business Development **Language of instruction is English**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Timo Pihkala
Aims	To provide students with a multi-perspective of concepts, frameworks, and models for understanding and analysing growth situations in SMEs.
Contents	The course focuses on the decisions owners/managers have to make in: - identifying and choosing opportunities for business growth - setting realistic growth strategies - identifying and allocating resources (technological, financial, human etc.) - organising, mobilising, motivating, empowering and rewarding staff - exercising control over all aspects of the business during the growth process - developing an organisational climate compatible with the internal and external factors necessary for growth.
Teaching Methods	20 hours of lectures and class discussions in English. The teaching method is student-centred. Students are expected to come thoroughly prepared for vigorous discussions on the readings and case studies issued in advance.
Assessment	Graded 0-5 on the basis of classes, case studies and an essay
Course Material	Compendium of articles and cases
Prerequisites	Basic knowledge of management

AC40A0150	*INTEGRATED MARKETING COMMUNICATION 5 ECTS cr*
	Integrated Marketing Communication
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 4
Lecturer(s)	Researcher/Teacher, D.Sc. (Econ. & Bus. Adm.) Liisa-Maija Sainio
Aims	To familiarize the student with the concept and process of marketing communication. To give the students basic skills in the design, implementation and management of communication as part of the marketing process.
Contents	The role of marketing communication in the marketing strategy of an enterprise. The concept and implementation of integrated marketing communication. The design, implementation and management of advertising, sales promotion and public relations. The introduction of electronic and print media, media choice, the creative process and execution of a promotion campaign. The services in campaign planning, the advertising business and the advertiser-agency relationship. Legal and ethical issues in advertising. The course focuses especially on mass communication because there is a separate course available in personal selling and sales management.
Teaching Methods	28 hours of lectures, 14 hours of exercises, groupwork and an individual ad analysis report, 4th period. Written exam. Obligatory intermediate course in International Marketing. Elective course in the Master's Degree Programme (CBU) in Business and Administration.
Assessment	0-5, written exam 50%, individual ad analysis 30%, groupwork 20%.
Course Material	1. Percy, Rossiter & Elliott (2001): Strategic Advertising Management, Oxford University Press. 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet, CS10A0000 Markkinoinnin peruskurssi or Ka6720000 Markkinoinnin ja hankintatoimen perusteet

AC40A0250	*SALES MANAGEMENT AND PERSONAL SELLING*	*5 ECTS cr*
	Sales Management and Personal Selling **All instruction will be in English.**	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 3-4	
Lecturer(s)	Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen	
Aims	To familiarize the students with the fundamentals of sales management and personal selling including negotiation skills as well as general issues in business to business and organizational selling.	
Contents	Special characteristics of business-to-business, industrial and organizational selling. Fundamentals of personal selling, negotiations and sales management.	
Teaching Methods	24 h of lectures in 3rd period. 14 h of exercises in 4th period. Written exam. Elective course in International Marketing subject studies.	
Assessment	0-5, written examination 60% of the final grade, Exercises 40% of the final grade	
Course Material	1. Johnston, Mark W. and Greg Marshall, 2006. Churchill/Ford/Walker's Sales Force Management. McGraw-Hill/Irwin, New York. 2. Manning, Gerald L., and Barry Reece, 2004. Selling Today, Creating Customer Value. 9th edition. Pearson Prentice hall, New Jersey. 3. Material distributed during lectures.	
Prerequisites	Ka6720000 Markkinoinnin ja hankintatoimen perusteet or AC40A0000 Kansainvälisen markkinoinnin perusteet (AC40A0050 Vienti- ja tuontitoiminta recommended).	

AC40A0350	*CORPORATE SOCIAL RESPONSIBILITY*	*5 ECTS cr*
	Corporate Social Responsibility	
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 3-4	
Lecturer(s)	M.Sc. (Econ. & Bus. Adm.) Riikka Anderson	
Aims	To familiarize students with concepts of Corporate Social Responsibility, Corporate Citizenship and Sustainable Development and with their relevance to business activities. To give students practice in implementing the concepts in real life like situations and in taking a view of different stakeholders.	
Contents	Concepts of CSR, SD and Corporate Citizenship; emerging management issues (ecology and environment, health and well-being, diversity and human rights, communities); impacts on business activities (company and industry level); standards and guidelines, different implementation models.	
Teaching Methods	15 hrs of lectures, intensive teaching (3rd period) Group assignments (4th period) WebCT assignments (4th period) Written exam. Elective course in International Marketing subject studies	
Assessment	0-5, Written exam 50%, Group assignments 30%, Learning diary 20%.	
Course Material	Grayson & Hodges (2002), Everybody's Business – Managing risks and opportunities in today's global society, DK Publishing, London. Klein, Naomi: No logo: No space, no choice, no jobs, Flamingo, 2001 Other material distributed during the course.	
Prerequisites	Ka6720000 Markkinoinnin ja hankintatoimen perusteet or AC40A0000 Kansainvälisen markkinoinnin perusteet	

AC40A0450	*HIGH TECHNOLOGY MARKETING*	*5 ECTS cr*
	High Technology Marketing **The number of students attending the course may have to be limited based on pre-exam if the number of students exceeds 30. In registration priority is given to LUT master's students.**	

Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4
Lecturer(s)	Professor, D.Sc. (Tech.) Sanna-Katriina Asikainen
Aims	The aim is to understand whether marketing for firms operating in high technology markets is different from traditional marketing? And, if so, why and how? To provide a deep understanding of the functions of marketing regarding challenges and opportunities in high technology products and markets. To assist the participants to understand the virtue and limitations of traditional marketing thinking and tools in emergent, high technology markets.
Contents	The course will be offered as a blend of lectures, guest lectures, presentations and discussions of selected topics and practical problems. Updated insights regarding challenges and opportunities in high technology markets; The concepts of technology and ”high-tech”; Innovations and new products in high-tech markets; Industry structure, industry changes and marketing implications; Marketing research in high-tech markets; Partnering; Entry timing; Marketing strategies in high technology markets, Organizing marketing activities in high-tech markets.
Teaching Methods	28 h of interactive lectures in the 4th period. Active participation. In- and out-class assignments. Exam. Obligatory course in International Marketing advanced studies. Elective course in Strategy Research advanced studies.
Assessment	0-5 Active class participation and assignments (40% of the final grade). Written exam (60% of the final grade). All assignments have to be passed.
Course Material	1. Mohr, Jakki, Sanjit Sengupta, and Stanley Slater (2005) Marketing of High-Technology Products and Innovations. Second Edition. Pearson Prentice Hall. 2. Assigned reading.
Prerequisites	Basic knowledge of international marketing.

AC40A0500	***CUSTOMER RELATIONSHIP MANAGEMENT 5 ECTS cr***
	Customer Relationship Management **The course will be lectured for the first time during the academic year 2008-2009. Substituting literature exams during the academic year 2007-2008.**
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 4
Lecturer(s)	Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Hanna Salojärvi
Aims	The aim of the course is to familiarize the students with relationship marketing theory and strategic management of customer relationships.
Contents	Basic issues in relationship marketing theory. Development of customer relationships and customer life-cycle. Large customer management. The role of customer knowledge in the management of customer relationships. Characteristics of customer relationship oriented organization.
Teaching Methods	21 hours of lectures, 14 hours of exercises, 4th period. Elective course in International Marketing subject studies.
Assessment	Written exam 70%, groupwork 30%, evaluation on scale 0-5.
Course Material	1. Payne, Adrian (2005), Handbook of CRM: Achieving Excellence through Customer Management, Butterworth- Heinemann 2. Assigned reading.
Prerequisites	AC40A0000 Kansainvälisen markkinoinnin perusteet

AC40A0550	INTERNATIONAL ENTREPRENEURSHIP 5 ECTS cr
	International Entrepreneurship **All instruction will be in English. The number of students attending the course may have to be limited based on pre-exam if the number of students exceeds 30.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 3-4
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo, Professor, D.Sc. (Econ. & Bus. Adm.) Olli Kuivalainen
Aims	To provide the students with both theoretical and practical insight into the processes of international entrepreneurship. To help the students develop an understanding of the nature and benefits of an international expansion strategy. The field project will expose the students to actual challenges that entrepreneurs have to deal with when internationalizing their businesses.
Contents	Evolution of International entrepreneurship, development of internationalization plan, competitive strategies and international business operations for small and medium-sized firms: e.g. marketing, human resources, R&D and financing, managing entrepreneurial ventures in the global marketplace. In the field project the students apply tools and frameworks related to international entrepreneurship to analyze a particular opportunity and create a business plan.
Teaching Methods	12 h of lectures including guest entrepreneurs as lecturers, 3.-4. period. 12 h of field project presentations, 3.-4. period. Group tutorials. Obligatory course in International Marketing advanced studies.
Assessment	0-5 Active class and tutorial participation Assignment 1: Case narrative of chosen firm/ entrepreneur (10% of final grade) Assignment 2: Field project & Presentation (40% of final grade) (Peer evaluation in the group work has an effect on the grade) Exam (50% of final grade)
Course Material	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) Assigned reading
Prerequisites	Basic understanding of international business. Entrepreneurship studies are recommended.

AC40A6050	CROSS-CULTURAL ENCOUNTERS 3 ECTS cr
	Cross-Cultural Encounters **Language of instruction is English**
Year and Period	B.Sc. (Econ. & Bus. Adm.) 2, Period 3
Lecturer(s)	M.A. Tanja Karppinen, Coordinator M.A. Kristiina Korjonen-Kuusipuro, Researcher M.A. Aino Harinen, Planning Officer
Aims	The purpose of the course is to develop students' abilities to understand and appreciate cultural differences both in business and private life.
Contents	Cultures and communication, verbal and nonverbal communication, national stereotypes, intercultural sensitivity, cross-cultural interaction, culture shock, adaptation, intercultural effectiveness, cultures and organisations, expatriate assignments.
Teaching Methods	24 hours of lectures and case exercises in English
Assessment	Graded 0-5 on the basis of activity, assignments given during the lectures and a portfolio composed of them.
Course Material	Reading material for the course provided by the lecturer
Prerequisites	Active participation and 80 % attendance

AC50A0050	*INTRODUCTION TO KNOWLEDGE MANAGEMENT, LITERATURE EXAM* *4 ECTS cr*
	Introduction to Knowledge Management, literature exam **No WebOodi registrations. The exam will take place in the Origo exam aquarium. Students will book their individual times for the exam using the exam aquarium application: http://www.lut.fi/fi/oppimiskeskus/origo/tenttiakvaario.html Master program of Knowledge management supplementary studies.**
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1-4
Lecturer(s)	Researcher/Teacher, D.Sc. (Econ. & Bus. Adm.) Hanna-Kaisa Ellonen
Aims	To gain an overall view of knowledge management, to understand key elements of knowledge management and the related functional principles and tools and their application in practise.
Contents	Key concepts, models, and tools of knowledge management and their applications.
Teaching Methods	Independent study of assigned literature and a written exam (Origo exam aquarium).
Assessment	0-5, exam 100%
Course Material	1. Newell et al. (2002). Managing Knowledge Work. Palgrave MacMillan, New York. 207 s. 2. Dalkir, Kimiz (2005). Knowledge Management in Theory and Practice. Elsevier, 350 s.

AC50A0300	*ORGANIZATIONAL LEARNING AND COMPETENCE MANAGEMENT* *6 ECTS cr*
	Organizational Learning and Competence Management
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 4
Lecturer(s)	Researcher/Teacher, Ph.D. (Psych) Jianzhong Hong, Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Lassi Köppä Lecturer(s) responsible: Researcher/Teacher, Ph.D. (Psych) Jianzhong Hong
Aims	The aim of this virtual course is to familiarize students to the key literature concerning organizational learning and competence management.
Contents	The course consists of three parts of virtual participation and interaction: 1) intensive reading of the course materials presented on the web and required journal articles and book chapters; 2) case analysis and written report by group; and 3) case presentation and discussion in the virtual discussion forum. The case analysis is conducted by the principles of the problem-based learning method.
Teaching Methods	4. period. Info-meeting at the beginning of the course. Guiding session before the start of the group work. Reading summaries, online exam, group assignment and discussion through LUT virtual learning tool WebCT. Obligatory in Knowledge Management advanced studies.
Assessment	0-5, individual literature study 40%, group work 60%
Course Material	1. Argyris, C. & Schön, D.A. (1996). Chapters from the book Organizational learning II: Theory, method, and practice. Reading Mass.: Addison Wesley. 2. Prahalad, C.K. & Hamel, G. (1990). The Core Competence of the Corporation, Harvard Business Review, May/June, 79-91. 3. Other assigned reading.

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

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
Lecturer(s)	Professor, Ph.D. Tauno Tiusanen Assistant, Anna Karhu
Aims	Students are able to evaluate the emerging markets and choose the right modes of operations in TEs.
Contents	Must know: Country profiles of European transitional economies (TEs). The communist legacy in TEs. Macro-economic framework of the transitional process. Post-communist region in the global economy. Risks and opportunities in the TE markets. Investment climate and foreign direct investment in the TEs. Should know: EU's enlargement process.
Teaching Methods	Lectures 42 h 3. period, exercises 14 h 3. period and 14 h 4. period.
Assessment	0-5, examination 50 %, exercises 25 %, research report 25 %.
Course Material	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: Transitional Economies and International Competitiveness, Northern Dimension Research Centre, Publication n:o 31, Lappeenranta University of Technology 2006. Tiusanen Tauno: Poland, the Largest New EU Country., Northern Dimension Research Centre, Publication n:o 4, Lappeenranta University of Technology 2004. Tiusanen Tauno: Development of the Russian Rouble - The Crisis of 1998 and Its Aftermath, Northern Dimension Research Centre, Publication n:o 3, Lappeenranta University of Technology 2003.
Prerequisites	CS10A0550 International Business Methods.

CS10A0650	MANAGEMENT OF HIGH-TECH ENTERPRISES AND INNOVATIONS IN RUSSIA 5 ECTS cr
	Management of High-tech Enterprises and Innovations in Russia , Teknologiayritysten ja innovaatioiden johtaminen Venäjällä
Year and Period	M.Sc. (Tech.) 1-2
Lecturer(s)	Professor, M.Sc. (Tech.) Juha Väätänen
Aims	To know the state of high-tech sectors and innovations management in Russia.
Contents	Must know: Key issues of technology and innovation management in Russia. Russian high-tech sectors. Should know: Russian innovation environment. Decision making in Russia, cultural characteristics. Management transformation in state owned and private companies. Nice to know: Managerial comparison between Russia and western countries in high-tech sectors. Transition of leadership and management in different business sectors.
Teaching Methods	Literature exam.
Assessment	0-5, examination.
Course Material	Nevens, Michael T., Summe, Gregory L., and Uttal, Bro (1990). "Commercializing Technology: What the Best Companies Do." Harvard Business Review May-June 1990: 154-163. Easingwood, Chris, Moxey, Steven, and Capleton, Henry (2006). "Bringing High Technology to Market: Successful Strategies Employed in the Worldwide Software Industry." The Journal of Product Innovation Management 23:498-511 Bingham, Peter (2003). "Pursuing Innovation in a Big Organization." Research Technology Management 46(4): 52-58. OECD (2005). Fostering Public-Private Partnership for innovation in Russia. OECD. ISBN 92-64-00965-5. Gianella, C., and W. Tompson (2007). "Stimulating Innovation in Russia: The Role of Institutions and Policies", OECD Economics Department Working Papers, No. 539, OECD Publishing. Fey, Carl F., Adaeva, Margarita, and Vitkovskaia, Anastasia (2001). "Developing a Model of Leadership Styles: What Works Best in Russia?" International Business Review 10: 615-643. Ivanova, Oksana, Kyrki, Anna, Selioukova, Yana, and Väätänen, Juha (2005). Case Study on Software Development Company –Opportunities and Challenges of Russian High-Tech Start-Up. Northern Dimension Research Centre, Publication 15, Lappeenranta University of Technology. Chesbrough, Henry (2003). "The Era of Open Innovation." MIT Sloan Management Review 44(3): 35-41.
Prerequisites	CS10A0800 The Basics of Doing Business in Russia.

CS10A0750	ENTERPRISES AND COMPETITION IN RUSSIA 5 ECTS cr
	Enterprises and Competition in Russia, Yritykset ja kilpailu Venäjällä
Year and Period	M.Sc. (Tech.) 1, Period 3
Lecturer(s)	Professor, M.Sc. (Tech.) Juha Väätänen
Aims	To understand Russian business environment, enterprise structures and competition on Russian markets.
Contents	Must know: Russian enterprise structures, emergence of new enterprises, natural resources and consumer markets. Should know: Russia´s competitiveness, dereculation of the economy, privatisation process and foreign direct investment development. Nice to know: Government regulations and licensing.
Teaching Methods	Lectures 35 h, presentations 20 h, seminar work 40 h, 3rd period.
Assessment	0-5, examination.
Course Material	Helanterä, Antti. Ollus, Simon-Erik. Why they, why not we? - An analysis of the

	competitiveness of Finland and Russia. 2004. Edita Prima Ltd. The World Bank. Transition, the First Ten Years - Analysis and Lessons for Eastern Europe and the Former Soviet Union. 2002. Additional material will be announced on lectures.
Prerequisites	CS10A0800 The Basics of Doing Business in Russia, not required from foreign exchange students.

CS10A0850	***TRANSITIONAL COUNTRIES INTEGRATION WITH THE EUROPEAN UNION - TRADE, MANUFACTURING AND LABOUR PERSPECTIVE*** ***5 ECTS cr***
	Transitional Countries Integration with the European Union - Trade, Manufacturing and Labour Perspective, Siirtymätalouksien integroituminen Euroopan Unioniin - kaupan, tuotannon ja työvoiman näkökulma
Year and Period	M.Sc. (Tech.) 1, Period 4
Lecturer(s)	Professor, M.Sc. (Tech.) Juha Väätänen
Aims	To understand the process of European Union enlargement and it's influence on the competitiveness of EU.
Contents	Must know: European Union enlargement process and competitiveness of EU. Should know: Special characteristics of new EU countries. Trade and investment flows. Nice to know: Harmonization of legislation and economies. Provisions for European Union enlargement.
Teaching Methods	Lectures 35 h, presentations 20 h, seminar work 40 h, 4th period.
Assessment	0-5, examination.
Course Material	Literature will be announced on lectures.
Prerequisites	No prerequisites.

CS10A7050	***BUSINESS ENVIRONMENT IN TRANSITIONAL ECONOMIES*** ***4 ECTS cr***
	Business Environment in Transitional Economies **Language of instruction is English**
Year and Period	M.Sc. (Tech.) 1, Period 4
Lecturer(s)	Professor, D.Ph. Tauno Tiusanen
Aims	To familiarize the students with various aspects of post-communist market, including development trends in internal and external economy. Special attention will be paid to the problem of how transitional economies (TEs) will integrate themselves into the global economy and how western companies react to this development.
Contents	The most important details of the communist legacy in TEs will be covered in order to familiarize the students with the problems of transition. The role of certain outside organizations in the transitional process will be described (IMF, EC, World Bank etc.). Special features of individual TEs are outlined and examples of business operations in Western companies provided.
Teaching Methods	Intensive course. 28 hours of lectures in English
Assessment	Graded 0-5 on the basis of active class participation and successful participation on case exercise
Course Material	1. Tiusanen Tauno, Kinnunen Jatta, Kallela Sami: EU's Enlargement Process: Investment Climate in 10 Transitional Economies, Lappeenranta University of Technology, Northern Dimension Research Centre, Publication No 7/2004 2. Tiusanen, Tauno: Poland, the Largest New EU Country, Lappeenranta University of Technology, Northern Dimension Research Centre, Publication

	No 4/2004 3. Tiusanen, Tauno: Development of the Russian Rouble - The Crisis of 1998 and its Aftermath, Lappeenranta University of Technology, Northern Dimension Research Centre, Publication No 3/2003 4. Tiusanen Tauno, Kinnunen Jatta: EU's Eastern Enlargement and the Future Expansion of the Eurozone, Lappeenranta University of Technology, Northern Research Centre, Publication No 23/2005 5. Tiusanen Tauno: Foreign Investors in Transitional Economies: Cases in Manufacturing and Services, Lappeenranta University of Technology, Northern Research Centre, Publication No 27/2006
Prerequisites	Good command in English and in business methods

CS30A1500	***TRANSPORTATION SYSTEMS***	***5 ECTS cr***
	Transportation Systems, Kuljetusjärjestelmät	
Year and Period	M.Sc. (Tech.) 1-2, Period 4 int.	
Lecturer(s)	Professor, D.Sc. (Econ. & Bus. Adm.) Olli-Pekka Hilmola	
Aims	Finland's logistical position in Europe as well as in the global context. Course will give basic understanding from different transportation modes (air, road, sea and rail), and their relation to users (e.g. companies) financial and non-financial performance. Combining different modes of transportation to represent overall transportation service (e.g. automation and containers). Role of Russia and Asia in the transportation flows of Europe. Third party logistics solutions. Value enhancement in logistical services and processes, M&A waves, and the reasons for service provider integration.	
Contents	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.	
Teaching Methods	Lectures 14 h and cases 12 h as intensive teaching in the 4th period.	
Assessment	0-5, examination (70 %) ja accepted case exercises (30 %).	
Course Material	1. Häkkinen, Lotta (2005). Operations Integration and Value Creation in Horizontal Cross-Border Acquisitions. Turku School of Economics and Business Administration, A-6 (Doctoral Diss.). Available at URL: http://www.tukkk.fi/julkaisut/vk/Ae6_2005.pdf 2. Woxenius, Johan (1998). Development of Small-Scale Intermodal Freight Transportation in a System Context. Chalmers University of Technology, Report 34 (Doctoral Diss.). Available at URL: http://www.mot.chalmers.se/staff/johwox/_private/English/Reports/1998%20Dissertation%20Woxenius.pdf 3. Laine, Jouni (2005). Redesign of Transfer Capabilities – Studies in Container Shipping Services. Helsinki School of Economics, A-254 (Doctoral Diss.). Available at URL: http://helecon3.hkkk.fi/pdf/diss/a254.pdf 4. 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. 5. Additional material provided by the lecturer (notes, articles and case exercises).	
Prerequisites	Recommended to have taken some logistical courses before, e.g. from topics of supply chain management and production control.	

CS34A0500	***TECHNOLOGY COMMERCIALIZATION AND CORPORATE VENTURING***	***5 ECTS cr***
	Technology Commercialization and Corporate Venturing, Teknologian kaupallistaminen	
Year and Period	M.Sc. (Tech.) 1-2, Period 4 int.	

Lecturer(s)	Professor, D.Sc. (Tech.) Marko Torkkeli Visiting lecturers
Aims	To understand the characteristics of technology commercialization and high growth technology ventures.
Contents	This course examines issues related technology commercialization, corporate venturing, and ways to profitably exploit business opportunities. Business models.
Teaching Methods	Lectures and guest speakers 28 h as intensive teaching in the 4th period. Written report.
Assessment	0-5. Written report 100 %.
Course Material	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.

FV18A9900	***FINNISH SOCIETY AND CULTURE***	***2 ECTS cr***
	Finnish Society and Culture **Language of instruction is English**	
Year and Period	Period 1-2 and 3-4	
Lecturer(s)	Dr. Kalle Michelsen, Professor (Finnish History, Political Culture, Social and Economic System) M.A. Kristiina Korjonen-Kuusipuro, Reseacher (Finnish Culture) Dr. Mika Tonder, Senior lecturer, (Landscapes, mentalities)	
Aims	The aim of this course is to introduce Finland and South Karelia to foreign students. The course provides basic information of Finnish history (focusing on Karelia and Karelian issues) from 1809 to the present, culture (arts, architecture and landscape), political system and international issues as well as social and economic systems (demography, ethnic, regional, gender and equality issues, trade, industry, science and technology).	
Teaching Methods	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) Society (4 lectures) E) Economic Systems (2 lectures) F) Nature and Landscape (4 lectures) G) Exam (2 lectures)	
Assessment	Passed on the basis of participation 60% and a written examination 40%.	
Course Material	Portraying Finland. Facts and Insights. Otava 2005. (Available in the library)	

14 Language Centre Courses 2007 – 2008

Further instructions on registering for language courses are provided in the Language Centre study guide and on the Internet at www.lut.fi/kike.

Remember to register for courses and exams separately.

		ECTS cr
FV11A0200	Activation of English Skills	3
FV11A1000	English for Marketing	3
FV11A2200	Technical English Reading Course 1	2
FV11A2400	Technical English Reading Course 2	2
FV11A2600	Business English Reading Course	2
FV11A3200	Information Technology	2
FV11A4200	Writing for Business	2
FV11A4600	Energy Issues	3
FV11A4900	Financial English	2
FV11A5200	English for Academic Seminars	3
FV11A5800	Aspects of Work	3
FV11A6200	English for Negotiating	3
FV11A6500	Presenting in English	2
FV11A7400	Technology and the Environment	3
FV11A8500	Machines and Processes	3
FV11A9000	Academic Seminar for International Programs	6
FV11A9100	Going International and Intercultural Communication	3
FV11A9150	English for Bachelor's Thesis	3
FV11A9200	Technical and Current Issues	2
FV11A9300	Scientific and Technical English Writing Course	4
FV11A9750	Aspects of Culture	3
FV12A1200	German 1	3
FV12A1300	Portfolio for Basic German Courses	2
FV12A1350	German-Finnish Language and Culture Tandem	1
FV12A1400	German 2	3
FV12A1600	German for Working Life	3
FV12A3200	Finland and Germany - Business Partner Scenario	3
FV12A4200	German for Chemical and Paper Technology	2
FV12A4400	German for Mechanical Engineering	2
FV12A4600	German for Energy Technology	2
FV12A6200	Listening Comprehension in German	1
FV12A6600	Getting to Know Austria and Switzerland	2
FV12A6800	German Culture and History	3
FV12A7000	Intercultural German Course	1
FV12A7200	Finnish Industry in German	2
FV12A7400	German for Forest Industry	2
FV12A7600	Business German	3
FV12A7800	Environmental issues in German	2
FV12A8000	Environmental technology in German	2
FV12A8400	German Business Communication	3
FV12A8600	Basics of Macroeconomics	3
FV12A8800	Negotiating in German	2
FV15A1200	French 1	3
FV15A1400	French 2	3
FV15A1500	French Pronunciation	2
FV15A1600	French for Working Life	3
FV15A4000	Suggestopedic French Course	2
FV15A5000	Business French	3
FV15A5500	Suggestopedic Course in Business French	2
FV15A6000	Finland in French – Intercultural course	4

FV16A1200	Spanish 1	3
FV16A1400	Spanish 2	3
FV16A1600	Spanish for Working Life	3
FV16A2200	Facts about Spain	1 - 3
FV16A5200	Intercultural Course for Finnish and Spanish Students	4
FV17A1200	Portuguese 1	3
FV17A1400	Portuguese 2	3
FV18A9100	Finnish for Foreigners 1	2
FV18A9200	Finnish for Foreigners 2	2
FV18A9300	Finnish for Foreigners 3	2
FV18A9800	German-Finnish Lingual and Cultural Tandem	1
FV19A1000	Chinese 1	3
FV19A2000	Chinese 2	3
FV19A3000	Chinese for Working Life 1	3
FV19A4000	Chinese for Working Life 2	3

Course Descriptions

FV11A0200	***ACTIVATION OF ENGLISH SKILLS***	***3 ECTS cr***
	Activation of English Skills **This course will no longer be accepted as part of the compulsory language requirement. This course will not be taught in the academic year 2007–2008.**	
CEF Level	Student entry level: B1 or lower according to the Common European Framework	
Aims	During the course, students will: - work on and improve their active listening skills - both listening for general understanding and for specific information, - work on their oral communication skills and coping mechanisms, - work on improving basic writing skills, - work on grammar that causes difficulties, - expand their active vocabulary both in general English as well as in more specific areas, such as business and engineering, - work on pronunciation, both on common problems as well as those specific to the individual.	
Contents	Using topics that they mainly decide on themselves, students go through a variety of exercises to help them gain confidence in their English skills and to prepare them for self-directed learning, as well as other, more difficult English language courses in the future. Language of instruction: English.	
Teaching Methods	56 hours of contact, with 22 hours required for homework and self-study. Completion of the course will be determined through continuous assessment both in class and through assignments. Thus, a minimum active attendance of 75 percent is required. This course is open to students from all disciplines. Please note that it will no longer be accepted as part of the compulsory language requirement.	
Assessment	Pass/Fail	
Course Material	There is no specific book requirement. There will be various sources of information used including textbooks, the Internet, possibly journals and magazines as well as material provided by the teacher and the students themselves.	
Prerequisites	B1 according to the Common European Framework. Students must assess their level of English before applying for the course using an online diagnostic tool called Dialang. It can be found at www.dialang.org. Students who have a B2 or higher are not eligible for this course as a rule.	

FV11A1000	*ENGLISH FOR MARKETING* *3 ECTS cr*
	English for Marketing **This course will not be taught in the academic year 2007–2008.**
Lecturer(s)	Paula Haapanen
CEF Level	Student entry level: B2 level according to the Common European Framework.
Aims	During the course, students will: • work on oral communication, active listening and writing skills • learn phrases to use in more specific scenarios such as negotiations, presentations and customer service, • work towards expanding their marketing vocabulary.
Contents	Through role plays, case studies and small group work, students will work towards increasing their oral fluency, written accuracy and active listening ability. Students will also have the opportunity for autonomous study through the group project and self-study exercises meant to help students prepare for discussions and exercises. The language of instruction is English.
Teaching Methods	48 contact hours, with at least 30 hours required for homework and self-study. This class is oriented towards students in business and marketing and they will be given priority. If there is space available, students from other disciplines will be welcome.
Assessment	Pass/Fail. Student marks will be determined through continuous assessment as well as self-assessment. For students to be eligible for this option, they must attend a minimum of 75% of the classes. Students who participate between 50 and 75% of the classes will be eligible to sit the final exam, which is made up of a speaking, listening and writing component.
Course Material	Materials will be provided by the teacher.
Prerequisites	B2 level according to the Common European Framework. Students should assess their level of English before the course using an online diagnostic tool called Dialang. It can be found at www.dialang.org. Students at levels of B1 and lower should consider independent language work to improve their level to the point that they can participate in the course (B2).

FV11A2200	*TECHNICAL ENGLISH READING COURSE 1* *2 ECTS cr*
	Technical English Reading Course 1
Year and Period	B.Sc. (Tech.) 1-3, M.Sc. (Tech.) 1, Period 1, 2, 3, 4
Lecturer(s)	Jukka Taipale N. N.
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 will be expected to know how to learn and master general technical vocabulary through reading general technical texts and be able to read quickly and effectively.
Contents	Vocabulary exercises, skimming, scanning and affixes, reading comprehension exercises, individual, pair or group work. The languages of instruction are both Finnish and English.
Teaching Methods	28 contact hours, with 24 hours required for homework and self-study. 1st period: group A, 2nd period: group B, 3rd period: groups C and D, 4th period: groups E and F. Attendance: 50% of the lessons. Marks are based on a reading comprehension test (duration 90 minutes). Students must do all the course assignments to be eligible for the examination.
Assessment	0–5
Course Material	Provided by the teacher.
Prerequisites	Students with a matriculation exam grade of A, B, C or a short course in

	English may enroll for the course. Students who have taken course Technical English Reading Course 2 or Business English Reading Course are not eligible for this course.

FV11A2400	***TECHNICAL ENGLISH READING COURSE 2 2 ECTS cr***
	Technical English Reading Course 2 **This course will not be taught in the academic year 2007–2008.**
Lecturer(s)	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 will be expected to know how to learn and master different types of text material, to utilise a variety of skills necessary for critical and creative reading, to develop the process of understanding not only what a writer says but why he says it and on what basis.
Contents	General technical reading texts. Activities which require both oral and written work in addition to reading. Vocabulary exercises, skimming, scanning. The languages of instruction are both Finnish and English.
Teaching Methods	28 contact hours, with 24 hours required for homework and self-study. Attendance: 50% of the lessons. Marks are based on a reading comprehension test (duration 90 minutes). Students must do all the course assignments to be eligible for the examination.
Assessment	0–5
Course Material	Provided by the teacher.
Prerequisites	Students with a matriculation exam grade of M, E or L may enroll for the course. Students who have taken course Technical English Reading Course 1 or Business English Reading Course are not eligible for this course.

FV11A2600	***BUSINESS ENGLISH READING COURSE 2 ECTS cr***
	Business English Reading Course
Year and Period	M.Sc. (Econ. & Bus. Adm.) 1, Period 1, 2, 3, 4
Lecturer(s)	Jukka Taipale Part-time Untenured Teacher, N. N.
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 will be expected to know how to learn and master general business vocabulary through reading general business texts, and to be able to read quickly and effectively.
Contents	Vocabulary exercises, skimming, scanning and affixes, reading comprehension exercises, individual, pair or group work. The languages of instruction are both Finnish and English.
Teaching Methods	28 contact hours, with 24 hours required for homework and self-study. 1st period: group A, 2nd period: group B, 3rd period: groups C and D, 4th period: group E. Attendance: 50% of the lessons. Marks are based on a reading comprehension test (duration 90 minutes). Students must do all the assignments to be eligible for the examination.
Assessment	0–5
Course Material	Provided by the teacher.
Prerequisites	Students who have taken course Technical English Reading Course 1 or Technical English Reading Course 2 are not eligible for this course.

FV11A3200	INFORMATION TECHNOLOGY 2 ECTS cr
	Information Technology
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1, 2, 3, 4
Lecturer(s)	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 will be expected to master the language needed to read and talk about issues connected with information technology and to have learned the study skills needed to follow lectures given in English.
Contents	The Internet / World Wide Web / Video will be used as a resource. A wide variety of teaching methods will be used, including exercises based on reading, writing, speaking and listening skills. The language of instruction is English.
Teaching Methods	28 contact hours, with 24 hours required for homework and self-study. 1st period: group A, 2nd period: group B, 3rd period: group C, 4th period: group D. Continuous assessment of the student's participation in class, resulting in an oral mark, and written exercises approved by the teacher. Attendance: 100% of the lessons.
Assessment	0–5, oral mark 50%, written exercises 50%
Course Material	Provided by the teacher and the students.

FV11A4200	WRITING FOR BUSINESS 2 ECTS cr
	Writing for Business
Year and Period	B.Sc. (Tech.) 1-3, B.Sc. (Econ. & Bus. Adm.) 1-3, Period 1, 2, 3, 4
Lecturer(s)	Paula Haapanen
CEF Level	B2 and above
Aims	By the end of the course, students will be able to: • use stock phrases and functional language to help them correspond in a number of professional situations in different registers. • differentiate between formal, less-formal and informal business correspondence. • find sources of reference in connection with writing. • critically read and constructively comment on other students' work through peer review.
Contents	Using a variety of sources and scenarios, and with guidance from the teacher, students will help each other to learn how to deal with a wide range of business correspondence: from requests and complaints to internal memos and reports. The language of instruction is English.
Teaching Methods	This class is based on Web Enhanced Language Learning. The course will mainly use the WebCT platform so that students can share ideas, critique each other's work and receive feedback from the teacher in small groups, which the teacher will assign at the beginning of the course. There will be two face-to-face tutor sessions of 2 hours and they will be used to address problems that students have encountered during individual study and virtual group work. Students will have 4 hours of contact and 48 hours of individual study, virtual group work and peer evaluation. 1st period: Group A 2nd period: Group B 3rd period: Groups C and D 4th period: Groups E and F Students of all disciplines are welcome. The marks are based on assignments, a portfolio and a learning journal.
Assessment	Pass/Fail. Students will be assessed at the B2 level.
Course Material	There is no specific book requirement. However, students are advised to obtain

	Andrew Littlejohn's book Company to Company.
Prerequisites	B1+ according to the Common European Framework. Students should assess their level of written English before the course using an online diagnostic tool called Dialang. It can be found at www.dialang.org . Students with a writing skill level of B1 or lower should consider independent language work to work on basic writing skills and to improve their level to the point that they can participate on the course.

FV11A4600	***ENERGY ISSUES***	***3 ECTS cr***
	Energy Issues	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 3–4	
Lecturer(s)	Lecturer, Peter Jones	
CEF Level	B2 and above	
Aims	To develop speaking, listening and reading skills based on the theme of energy.	
Contents	Language practice and exercises based on various energy issues – ranging from technological challenges to economic and environmental considerations. Language of instruction: English.	
Teaching Methods	Contact hours: 48 (24+24) Homework 30+ Periods 3–4: Groups A and B Attendance required (75%). Written test and continuous assessment/oral test.	
Assessment	0–5, written test (50%), continuous assessment/oral test (50%)	
Course Material	Provided by the teacher.	

FV11A4900	***FINANCIAL ENGLISH***	***2 ECTS cr***
	Financial English	
Year and Period	Period 1, 2	
Lecturer(s)	Lecturer, Peter Jones Lecturer, Timothy Fowler	
CEF Level	B2 and above	
Aims	To improve English skills in the field of financial management.	
Contents	The language of finance, including business finance, taxation, investment etc. Language of instruction: English.	
Teaching Methods	Contact hours: 24 Homework: 15+ Attendance required. Written test. Period 1: Groups A and B Period 2: Groups C, D and E	
Assessment	0–5, written test (100%).	
Course Material	Provided by the teacher.	

FV11A5200	***ENGLISH FOR ACADEMIC SEMINARS***	***3 ECTS cr***
	English for Academic Seminars **Students who have attended Scientific and Technical Writing Course or Academic Seminar for International Programs are not eligible for this course.**	
Year and Period	B.Sc. (Tech.) 3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1–2, 3–4	
Lecturer(s)	Lecturer, Timothy Fowler	
CEF Level	B2 and above	
Aims	To learn and practise basic skills needed to research and give an academic seminar in English.	

Contents	Students will study features of English for academic and scientific writing. Students will research and hold a seminar in English. Language of instruction: English.
Teaching Methods	Contact hours: 24 (Period 1 and 3) Homework: 55+ Seminar: (Period 2 and 4) Attendance required (80%). Seminar paper and presentation. Students who have attended Scientific and Technical Writing Course or Academic Seminar for International Programs are not eligible for this course.
Assessment	0–5, seminar paper and presentation (100%).
Course Material	Provided by the teacher.
Prerequisites	The course is primarily meant for students of chemical technology. The course in periods 1–2 is exclusively for those students majoring in applied chemistry. Students of other departments are welcome to apply to the course in periods 3–4.

FV11A5800	***ASPECTS OF WORK***	***3 ECTS cr***
	Aspects of Work	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1–2, 3–4	
Lecturer(s)	Lecturer, Hwei-Ming Boey Lecturer, Timothy Fowler	
CEF Level	B2 and above	
Aims	• To develop the student's speaking, listening and reading skills • To discuss various types of CVs and letters of application	
Contents	Issues concerning work. Language of instruction: English.	
Teaching Methods	48 contact hours + 30 hours independent study 1st–2nd period (groups A and B), 3rd–4th period (groups C, D and E) 75% attendance required. Tests: 1) A reading comprehension and writing test 2) An oral expression test (Students whose speaking skills can be continuously assessed in class will be exempted from the oral expression test.)	
Assessment	0–5, reading comprehension and writing test 50%, oral expression or continuous assessment 50%.	
Course Material	Provided by the teacher.	

FV11A6200	***ENGLISH FOR NEGOTIATING***	***3 ECTS cr***
	English for Negotiating	
Year and Period	B.Sc. (Tech.) 3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 3–4, 5	
Lecturer(s)	Lecturer, Hwei-Ming Boey Lecturer, N. N.	
CEF Level	B2 and above	
Aims	To practise the language needed for participating in negotiations.	
Contents	Discussion and practice of the language for effective negotiating, participation in simulations of negotiations. Language of instruction: English.	
Teaching Methods	48 contact hours + 30 hours independent study 3rd–4th period: groups A and B 5th period: group C (intensive course) Continuous assessment. 80% attendance required.	
Assessment	0–5	
Course Material	Provided by the teacher.	

FV11A6500	*PRESENTING IN ENGLISH*	*2 ECTS cr*
	Presenting in English **Previously English for Presentations.**	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1, 2	
Lecturer(s)	Lecturer, Peter Jones	
CEF Level	B2 and above	
Aims	To improve the ability to construct and deliver spoken presentations in English.	
Contents	The language of presentations: • Starting a presentation, controlling the flow, the language of diagrams, summing up, handling questions etc. • Delivering presentations in a supportive context. • Analysing one's own performance and establishing areas in need of further development. Language of instruction: English.	
Teaching Methods	Contact hours: 24 Homework: 25+ Period 1: Groups A and B Period 2: Groups C and D Classroom exercises, presentation practice, and homework. 75% attendance required.	
Assessment	Pass/Fail. Evaluated presentation (100%).	
Course Material	Provided by the teacher.	

FV11A7400	*TECHNOLOGY AND THE ENVIRONMENT*	*3 ECTS cr*
	Technology and the Environment	
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1–2	
Lecturer(s)	Lecturer, Hwei-Ming Boey	
CEF Level	B2 and above	
Aims	To develop the student's speaking, listening and reading skills.	
Contents	Issues concerning the environment. Language of instruction: English.	
Teaching Methods	48 contact hours + 30 hours independent study 1st–2nd period: Groups A and B 75% attendance required. A listening comprehension and an oral expression test. Students whose speaking skills can be continuously assessed in class will be exempted from the oral expression test.	
Assessment	0–5, listening comprehension 50% of final mark, oral expression/continuous assessment 50%.	
Course Material	Provided by the teacher.	

FV11A8500	*MACHINES AND PROCESSES*	*3 ECTS cr*
	Machines and Processes	
Year and Period	B.Sc. (Tech.) 1-3, Period 1–2	
Lecturer(s)	Paula Haapanen	
CEF Level	B2–C1	
Aims	By the end of the course, students will be expected: • to describe machines and their functions. • to describe processes. • to identify and construct a classic scientific definition. • to carry out clear and well organized presentations for a variety of stakeholders.	

	• to compile a glossary specific to their fields of study. • to show effective summarizing skills. • to show an improvement in spoken fluency. • to demonstrate ability to actively work in groups. • to show effective critical feedback skills.
Contents	Using technically-oriented materials, students will mainly work on their oral communication skills, with some concentration on active listening skills and summary writing skills.
Teaching Methods	48 hours, with at least 30 hours required for homework and self-study. 1st–2nd period: Groups A and B. This class is for students in engineering. If there are spaces available, students from other disciplines are welcome.
Assessment	Pass/Fail will be determined through continuous assessment as well as self-assessment. For students to be eligible for this option, they must attend a minimum of 75% of the classes. Students who participate between 50 and 75% of the classes will be eligible to sit the final exam, which is made up of a speaking (50%), listening (25%) and writing (25%) component.
Course Material	Materials will be provided by the students and the teacher.
Prerequisites	B2 level according to the Common European Framework. Students must assess their level of English before the course using an online diagnostic tool called Dialang. It can be downloaded at www.dialang.org. Alternatively, students can access Dialang in Origo, in Sini and Cosini. Students are also expected to know the following before coming to class: • the names of basic shapes and their adjective forms, • how to read numbers and decimals in English. Self-study materials are available online and in the self-access room (1410B) for review.

FV11A9000	***ACADEMIC SEMINAR FOR INTERNATIONAL PROGRAMS*** ***6 ECTS cr***
	Academic Seminar for International Programs
Year and Period	Period 2–4
Lecturer(s)	Lecturer, Barbara Miraftabi Lecturer, Peter Jones
CEF Level	Students should have a B2 or C1 level according to the Common European Framework.
Aims	By the end of the course, students will be able to: • demonstrate an ability to take lecture notes • analyze weaknesses in their spoken English • demonstrate skills for participating in seminar discussions • write an acceptable seminar paper • present an oral report on the seminar paper
Contents	During the second period of the autumn semester, concentration will be on listening and oral skills. Students will work in small groups to critique each other's language skills and help each other to develop. Short presentations will be given to practice presentation skills, and this will be a period with a great deal of independent study. During the third and fourth periods, writing theory will be presented and students will write for peer group review. In order to pass the course, each student must submit a paper written about a subject assigned by a department instructor. After peer review (in order to monitor, critique and support each other's work) and consultation with the writing instructor, the paper may have to be rewritten until grammar, unity, cohesion, etc are acceptable. The course will also include an oral presentation of the paper as if it were to be presented at a conference. The language of instruction and all activities is English.

Teaching Methods	72 hours contact lessons, 84 hours independent study 2nd–4th periods: groups A and B The course is offered once during the academic year for the departmental international master's degree programs. It is wise to remember that attendance is important. Since this is a 6 ECTS course, student responsibility will be noted and a student may fail if not attending the classes regularly.
Assessment	Pass/Fail
Course Material	No required book; handouts from various books, material developed by language teachers, and information on the Internet will all be used.
Prerequisites	Acceptance by a department of LUT into an International Master's Degree program. Students should have a B2 or C1 level according to the Common European Framework.

FV11A9100	***GOING INTERNATIONAL AND INTERCULTURAL COMMUNICATION*** ***3 ECTS cr***
	Going International and Intercultural Communication
Year and Period	Period 1–2
Lecturer(s)	Lecturer, Barbara Miraftabi
CEF Level	Teaching level: C2; language will not be taught and students will gain in fluency at B2/C1 levels.
Aims	At the end of the course, a student will be expected: • to demonstrate understanding of the concept of culture and how it is learned. • to explain the iceberg analogy of culture in contrast to other analogies of culture. • to demonstrate an ability to use the DIE observation skills model, e.g. with pictures. • to show they can work effectively in small groups. • to show they can risk new behaviour by sharing in large groups. • to explain cultural learning in areas like ideas, sentiments, values, etc by using Finland as an example. • to explain the basic principle of culture related to semiotics. • to put oneself on the Milton Bennett model of intercultural sensitivity chart.
Contents	Through the principles of experiential learning and general interculturalist theories, students will analyze their own cultures, practise observation of culture by using Finnish situations, and learn more about self as a cultural being. Students will write response papers both individually and in groups regarding different aspects of the course to show a grasp of the principles and self awareness.
Teaching Methods	48 h contact lessons, 30 h independent study and homework. Periods 1–2, groups A and B, taught once in the academic year. NOTE: Although credits/points are given to fulfil language requirements, the course is a content course studying culture and not a language course studying language. The language of instruction and all student activities is English, and many activities will involve students in activities outside of the classroom. Students (with a level of at least B2) from all departments are welcome. Preference will be given to students applying to be exchange students or planning to work abroad. Since experiential learning techniques are important for the course, do not take this course if you plan a lengthy vacation during the class period. Any absence lasting longer than three consecutive class meetings will require additional work on the part of the student.
Assessment	Pass/Fail
Course Material	No required book; handouts will be given and Internet sources used.

FV11A9150	ENGLISH FOR BACHELOR'S THESIS 3 ECTS cr
	English for Bachelor's Thesis **The course is aimed only at students of Supply Management and International Marketing doing their bachelor's thesis in English at the Lappeeranta University of Technology, School of Business at the time of the course.**
Year and Period	B.Sc. (Econ. & Bus. Adm.) 3, Period 1–2
Lecturer(s)	Riitta Gröhn
CEF Level	teaching level: B2/C1
Aims	To write a draft of a bachelor's thesis and to present the thesis in the context of the Bachelor's Thesis Seminar.
Contents	The course is integrated in the bachelor's thesis seminar and consists of two parts: academic writing and oral presentation skills. There will be two lectures, three hours each: a short introduction to academic writing in the beginning and an introduction to presentation skills. Each student will get the support of the teacher during their writing process, as well as feedback and evaluation in the end. The course will also include an oral presentation of the thesis, which will be evaluated by the teacher.
Teaching Methods	The course is optional and it consists of 6 contact hours, 2 hours of individual tutorials per student and 70 hours of independent work monitored by the teacher. The maximum number of students accepted to the course is 10. In case of more applicants, there will be a selection made according to the criteria based on the individual student's needs.
Assessment	0–5 is done on the basis of development shown in the writing process and oral presentation skills.
Course Material	Savage, Alice & Shafiei Masoud. Effective Academic Writing 1. Oxford University Press. Handouts from various sources, including material developed by the teacher.

FV11A9200	TECHNICAL AND CURRENT ISSUES 2 ECTS cr
	Technical and Current Issues
Year and Period	B.Sc. (Tech.) 2-3, M.Sc. (Tech.) 1-2, B.Sc. (Econ. & Bus. Adm.) 2-3, M.Sc. (Econ. & Bus. Adm.) 1-2, Period 1–2, 3–4
Lecturer(s)	Jukka Taipale Lecturer, Timothy Fowler
CEF Level	Level coming into the course: C1.
Aims	By the end of the course, students will have increased their fluency in English and improved their understanding of spoken discourse, both technical and general.
Contents	Language practice and exercises based on audio and video material from a variety of sources concerning topics of interest, both technical and general. Language of instruction: English.
Teaching Methods	Contact hours: 26 Homework: 25+ 1st–2nd period: Groups A and B 3rd–4th period: Groups C and D Listening comprehension test. Continuous assessment/speaking test. 75% attendance required. Students who have attended the course Current Issues are not eligible for this course.
Assessment	0–5, listening comprehension test (50%), continuous assessment/speaking test (50%).
Course Material	Provided by the teacher.
Prerequisites	Students' spoken ability should be at a C1 level.

FV11A9300	*SCIENTIFIC AND TECHNICAL ENGLISH WRITING COURSE* *4 ECTS cr*
	Scientific and Technical English Writing Course **The course is meant for DI 1–2 NPS students in 2007–2008.**
Year and Period	M.Sc. (Tech.) 1-2, Period 3–4
Lecturer(s)	Lecturer, Barbara Miraftabi
CEF Level	By the end of the course, students should be at a C1 level in writing skills.
Aims	At the end of the course, students will demonstrate their grasp of academic writing theory by: • writing a draft of a research paper or some other acceptable paper (related to the fields of study offered at LUT) negotiated with the instructor • presenting the paper orally • rewriting parts of the paper as needed
Contents	The draft of the paper must contain acceptable sections as covered in theory classes. Papers may have to be rewritten until grammar, unity, cohesion, etc are acceptable. The course will also include an oral presentation of the paper. The language of instruction is English.
Teaching Methods	48 hours contact lessons, 56 hours independent study. 3rd–4th period (1 group). The course is meant for DI 1–2 NPS students in 2007-2008. Students should have a B2 or C1 level of English and some piece of factual material related to their field of study to develop for writing a paper.
Assessment	Pass/Fail
Course Material	No book required; there will be handouts from various books, including materials developed by the teacher. Information on the Internet will also be referenced.
Prerequisites	A CEF B2 level in writing and speaking skills.

FV11A9750	*ASPECTS OF CULTURE* *3 ECTS cr*
	Aspects of Culture **This course is for students of the Master's Degree Programme in New Packaging Solutions (KOTE).**
Year and Period	Period 1–2
Lecturer(s)	Kristiina Karjalainen
CEF Level	Student level entering the course: B2.
Aims	At the end of the course students will be expected: - to demonstrate understanding of the concept of culture and how it is learned - to explain the iceberg analogy of culture in contrast to other analogies of culture - to demonstrate an ability to use the DIE observation skills model, e.g. with pictures - to explain cultural learning in areas like ideas, sentiments, values, etc by using Finland as an example - to demonstrate understanding of the concepts of intercultural communication - to show they can work effectively in small groups - to adapt some of the learned cultural and intercultural communication concepts in their working life.
Contents	Through the principles of experimental learning and general interculturalist theories, students will analyze their own culture, practice observation of culture by using Finnish situations, and learn more about self as a cultural being. Students will write response papers both individually and in groups regarding different aspects of the course to show a grasp of the principles and self awareness. Language of instruction: English.
Teaching Methods	27 h contact lessons, 54 h independent study and homework using the WebCT learning management system.

	NOTE: Although credits/points are given to fulfill language requirements, the course is a content course studying culture and not a language course studying language. The language of instruction and all student activities is English, and many activities will involve students in activities outside of the classroom. Students also need a working knowledge of basic computer skills, e.g. downloading materials, downloading and listening audiovisual culture lectures, using links, online communication tools etc.
Assessment	Continuous assessment based on 75% attendance, active class participation, the papers, and group and individual presentations. Pass/Fail. Since experimental teaching techniques are important for the course, do not take this course if you plan a lengthy vacation during the class period. Any absence lasting more than 7 hours of class meetings will require additional work on the part of the student.
Course Material	No required book. Course materials consist of downloaded materials from the learning management system (WebCT) and handouts in class.

FV12A1200	***GERMAN 1*** ***3 ECTS cr***
	Saksa 1
Year and Period	Period 1–2, 3–4
Lecturer(s)	Lecturer, Karita Riekko Lecturer Sanna Heikkeri (substitute) Lecturer Cornelia Erdmann (substitute)
CEF Level	Entry level: 0, target level: A1.1
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 fill out their personal information in a form and write a short and simple text related to topics discussed during the course • to understand key words in a text related to topics discussed during the course • to use polite phrases and expressions typical of the German communication culture
Contents	Situations: introducing oneself, studies, tasks and schedules, office, restaurant, family. Structures: verbs in the present tense, negation, word order, the accusative and related prepositions, modal verbs, numerals, personal pronouns. Languages of instruction: German and Finnish.
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24+24), independent study approx. 30 hours. Languages of instruction: German and Finnish. 1st–2nd period (Groups A, B and C), 3rd–4th period (Groups D and E). Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.
Assessment	Pass/fail.
Course Material	Fahrplan - tekstit ja sanastot & Fahrplan - kielioppi ja harjoitukset, Chapters 1-7

FV12A1300	***PORTFOLIO FOR BASIC GERMAN COURSES 2 ECTS cr***
	Saksan kielen peruskurssien portfolio **Starts in German 1 and ends in German for Working Life.**
Year and Period	Period 1–4, 3–4
Lecturer(s)	Lecturer, Karita Riekko Lecturer, N. N.
CEF Level	Entry level: 0, target level: A1–A2.1.
Aims	By the end of the course, students are expected

	- to be able to develop their language skills more independently - to be able to apply vocabulary and grammatical structures learned in basic courses to a number of contexts - to expand on the vocabulary from basic courses.
Contents	The student compiles a portfolio during courses German 1, German 2 and German for Working Life, including the student's own writings and material collected by him/her. Languages of instruction: German and Finnish.
Teaching Methods	Independent work 52 hours, portfolio.
Assessment	Pass/fail based on the portfolio. The student must not dispose of the material related to the portfolio before the final grade is given.

FV12A1350	***GERMAN-FINNISH LANGUAGE AND CULTURE 1 ECTS cr TANDEM***
	Saksalais-suomalainen kieli- ja kulttuuritandem
Year and Period	Period 1–2, 3–4
Lecturer(s)	Lecturer, Karita Riekko
CEF Level	Entry level: 0, target level: A1–C2
Aims	By the end of the course, students are expected - to be able to apply their cultural knowledge in a number of contexts - to have developed their language skills
Contents	German and Finnish students pair up and learn about each other's language and culture. Each student keeps a learning journal discussing and analysing what they have learned. Languages of instruction: German and Finnish.
Teaching Methods	Contact hours 4, pair work 22 hours. The course can be completed during one or two semesters. Learning journal. The teacher e-mails the students about the date and time of the first contact lesson.
Assessment	Pass/fail.

FV12A1400	***GERMAN 2*** ***3 ECTS cr***
	Saksa 2
Year and Period	Period 1–2, 3–4
Lecturer(s)	Lecturer, Karita Riekko Lecturer Cornelia Erdmann (substitute)
CEF Level	Entry level: A1.1, target level: A1.2.
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 • to understand and apply the most important German customs.
Contents	Situations: living, place of residence, on the phone, travelling. Structures: the dative, possessive pronouns, prepositions, the imperative, ordinals, subordinate clauses, the present perfect. Languages of instruction: German and Finnish.
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24+24), independend study approx. 30 hours. 1st–2nd period (Groups A and B), 3rd–4th period (Groups C and D). Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.
Assessment	Pass/fail.
Course Material	Fahrplan - tekstit ja sanastot & Fahrplan - kielioppi ja harjoitukset, Chapters 8-14.
Prerequisites	German 1 or equivalent skills.

FV12A1600	*GERMAN FOR WORKING LIFE* *3 ECTS cr*
	Työelämän saksaa
Year and Period	Period 1–2, 3–4
Lecturer(s)	Lecturer, Karita Riekko Lecturer Cornelia Erdmann (substitute)
CEF Level	Entry level: A1.2, target level: A2.1.
Aims	By the end of the course, students are expected to be able • to talk about themselves as employees • to talk about work and the working environment • to write a simple job application and CV • to understand the main points of general texts on the world of work • to compare the work cultures of Finland and Germany
Contents	Situations: the working day, applying for a job, visiting a company, the working environment, purchases and sales, equipment, encountering different cultures. Structures: reflexive verbs, the past tense, the infinitive, conjugation and comparative forms of adjectives, relative pronouns, the passive voice, the conditional, the genitive. Languages of instruction: German and Finnish.
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24+24), independent study approx. 30 hours. 1st–2nd period (Groups A and B), 3rd–4th period (Groups C and D). Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation. Students who have completed German 3 are not eligible for this course due to the similar content.
Assessment	Pass/fail.
Course Material	Fahrplan 2
Prerequisites	German 2 or equivalent skills.

FV12A3200	*FINLAND AND GERMANY - BUSINESS PARTNER SCENARIO* *3 ECTS cr*
	Finnland als Partner
Year and Period	Period 1–2, 3–4
Lecturer(s)	Lecturer, Jörg Wunderlich
CEF Level	Entry level: A2.
Aims	By the end of the course, students are expected to be able - to recognise differences and similarities between the Finnish and German cultures - to use their speaking skills in cooperation with German partners - to give presentations in German
Contents	General forms of communication, such as writing an invitation, preparing for meetings, making a hotel reservation, going to a restaurant, organisation of informal get-togethers, preparing a schedule for a visit, talking on the phone, taking visitors sight-seeing. Students prepare a short presentation on a topic related to the country, e.g. geography, culture, media, history, politics, sports, climate. Discussions on cultural differences between Finland and Germany. Language of instruction: German.
Teaching Methods	Contact hours 48 (24+24), independent work approx. 30 hours. 1st–2nd period (Groups A and B), 3rd–4th period (Groups C and D). 3rd–4th period Group E once a week in the evening (4 h/week) at the university in cooperation with SCP. Pair and group assignments, listening comprehension, role play. Active participation. Grade based on continuous assessment or an oral test and listening comprehension test. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Materials provided by the teacher.
Prerequisites	German for Working Life, Activation of German or equivalent skills.

FV12A4200	*GERMAN FOR CHEMICAL AND PAPER TECHNOLOGY* *2 ECTS cr*
	Chemie und Papier
Year and Period	Period 4
Lecturer(s)	Lecturer, Jörg Wunderlich
CEF Level	Level: B1.
Aims	By the end of the course, students are expected - to know basic terminology in the field (written and spoken) and to be able to describe a process - to understand texts on chemical technology and paper technology - to know grammatical structures needed in technical usage - to be able to give a presentation in German.
Contents	Practicing basic terminology with texts and pictures. Revising grammar needed in technical language. Language of instruction: German.
Teaching Methods	Contact hours 24, independent work approx. 28 hours, 4th period (1 group). Continuous assessment requires 75% attendance and active participation. Successfully completed written and spoken assignments or written and oral test.
Assessment	0–5
Course Material	Material provided by the teacher.
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A4400	*GERMAN FOR MECHANICAL ENGINEERING* *2 ECTS cr*
	Deutsch im Maschinenbau
Year and Period	Period 2
Lecturer(s)	Lecturer, Jörg Wunderlich
CEF Level	Level: B1
Aims	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 - to know grammar needed in technical language.
Contents	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.
Teaching Methods	Contact hours 14, independent work (online) approx. 38 hours. 2nd period (1 group). Continuous assessment requires 75% attendance and active participation. Successfully completed written and spoken assignments or written and oral test.
Assessment	0–5
Course Material	Online material and exercises: http://www.uni-tuebingen.de/ael/deuma/deuma_overview.htm
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A4600	*GERMAN FOR ENERGY TECHNOLOGY* *2 ECTS cr*
	Energietechnik
Year and Period	Period 1
Lecturer(s)	Lecturer, Jörg Wunderlich
CEF Level	B1
Aims	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 - to be able to give a presentation in German.
Contents	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.
Teaching Methods	Contact hours 24, independent work approx. 28 hours, 1st period (1 group). Successfully completed written and spoken assignments or written and oral test. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Material provided by the teacher.
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A6200	***LISTENING COMPREHENSION IN GERMAN 1 ECTS cr***
	Hörkurs Deutsch
Year and Period	Period 3
Lecturer(s)	Lecturer, Jörg Wunderlich
CEF Level	Entry and target level: B1
Aims	Students are expected to understand spoken language at a normal pace.
Contents	Listening comprehension exercises. New vocabulary. Language of instruction: German.
Teaching Methods	Contact hours: 12, independent work approx. 14 hours. 1st period (1 group). Grade based on continuous assessment and listening comprehension exercises or a listeng comprehension test. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Listening comprehension exercises (partly in the WebCT learning environment), material provided by the teacher.
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A6600	***GETTING TO KNOW AUSTRIA AND SWITZERLAND 2 ECTS cr***
	Die Alpenländer
Year and Period	Period 4
Lecturer(s)	Lecturer, N. N.
CEF Level	B1
Aims	To learn about the characteristics of Austria and Switzerland. By the end of the course, students will be able to - give a short presentation on one of the topics dealt with in class - recognise differences and similarities between German-speaking countries.
Contents	Taking a look behind Austrian and Swiss stereotypes. Learning the essentials of the countries' history, culture, society and business through texts, videos and the Internet. Language of instruction: German.
Teaching Methods	Contact hours 24, independent work approx. 28 hours. 4th period (1 group). Pair and group work in class, written and spoken assignments. Grade based on successfully completed assignments or a written exam. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Handouts given by the teacher.
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A6800	*GERMAN CULTURE AND HISTORY*	*3 ECTS cr*
	Kultur und Geschichte	
Year and Period	Period 3–4	
Lecturer(s)	Lecturer, Sanna Heikkeri	
CEF Level	B1	
Aims	By the end of the course, students will be able to - identify important German personalities from different periods in time and briefly relate what kind of impact they had on culture and society - understand the essential cultural developments in Germany - explain in more detail the developments in Germany after World War II in order to better understand the current societal structure and its main influencing factors - have a discussion in German on important societal and cultural topics and compare the German and Finnish society and culture - critically analyse German literature and movies - independently study texts in German on historical, societal and cultural topics, identify the key information and summarise it in their own words.	
Contents	A variety of written and spoken assignments related to German culture, history and society, independent and group work, presentations and discussion. Language of instruction: German.	
Teaching Methods	48 contact hours + approx. 30 hours of independent work. Continuous assessment requires 75% attendance and active participation.	
Assessment	Grade based on continuous assessment (50%) and presentations and written assignments (50%). 0–5	
Course Material	Material provided by the teacher.	

FV12A7000	*INTERCULTURAL GERMAN COURSE*	*1 ECTS cr*
	Interkultureller Kurs	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Lecturer Sanna Heikkeri (substitute)	
CEF Level	B2	
Aims	By the end of the course, students will be able to - easily understand a native German speaker - understand different German dialects - express and explain their opinions in German - talk about Finnish culture and traditions in German - master ”small-talk” in German	
Contents	Topics chosen by the group. Language of instruction: German.	
Teaching Methods	Discussion with both a German native teacher and German exchange students. Contact hours 24 (6 meetings, dates set in the 1st meeting): 1st–2nd period (Group A), 3rd–4th period (Group B). Continuous assessment, requires 75% attendance and active participation.	
Assessment	Pass/fail.	
Prerequisites	Courses at B1 level or equivalent skills.	

FV12A7200	*FINNISH INDUSTRY IN GERMAN*	*2 ECTS cr*
	Finnische Industrie	
Year and Period	Period 4	
Lecturer(s)	Lecturer, Jörg Wunderlich	
CEF Level	B1	
Aims	By the end of the course, students will be expected to be able to tell and write	

	about Finnish industry and products. Students are also expected to be able to give a presentation on Finnish industry in German.
Contents	Exploring material on Finnish industry available in German. The course is suitable for students from any department. Language of instruction: German.
Teaching Methods	Contact hours 24, independent work approx. 28 hours. 4th period (1 group). Continuous assessment requires 75% attendance and active participation. Individual, pair and group work. Successfully completed written and spoken assignments or a written and oral test.
Assessment	0–5
Course Material	Material provided by the teacher and Finnish company web sites in German.
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A7400	***GERMAN FOR FOREST INDUSTRY***	***2 ECTS cr***
	Wald und Holz	
Year and Period	Period 1	
Lecturer(s)	Lecturer, Jörg Wunderlich	
CEF Level	B1	
Aims	By the end of the course, students will - know basic terminology related to the field - be able to describe issues related to the forest industry - understand texts on the forest industry - know the grammatical structures related to technical language.	
Contents	Forestry, wood trade, harvesting, wood processing (sawmills). Revision of grammatical structures needed in technical language. Oral exercises during contact lessons once a week. Language of instruction: German.	
Teaching Methods	Contact hours 14, independent work (online) approx. 38 hours. 1st period (1 group). Successfully completed written and spoken assignments or written and oral test. Continuous assessment requires 75% attendance and active participation.	
Assessment	0–5	
Course Material	Material and exercises online: http://www.uni-tuebingen.de/ael/ilegefos/ilegefos_overview.htm	
Prerequisites	Facts about Finland and Germany or equivalent skills.	

FV12A7600	***BUSINESS GERMAN***	***3 ECTS cr***
	Wirtschaftsprache Deutsch	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Lecturer Sanna Heikkeri (substitute)	
CEF Level	B1	
Aims	By the end of the course, students are expected to - understand business-related texts in German - know vocabulary and structures in business texts - know the special characteristics of German business texts - be able to describe the Finnish economy in German - be able to critically analyse German business texts - be able to produce high-quality business texts in German	
Contents	Individual, pair and group work. Business vocabulary exercises, reading and writing business texts. The course is suitable for students from any department. Language of instruction: German.	
Teaching Methods	Contact hours 48 (24+ 24), independent work approx. 30 hours: 1st–2nd period (Groups A and B), 3rd–4th period (Groups C and D). Continuous assessment and successfully completed written assignments or written test.	

	Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Provided by the teacher.
Prerequisites	German for Working Life or equivalent skills.

FV12A7800	***ENVIRONMENTAL ISSUES IN GERMAN 2 ECTS cr***
	Deutsch für die Umwelt
Year and Period	Period 2
Lecturer(s)	Lecturer, Jörg Wunderlich
CEF Level	B1
Aims	By the end of the course, students are expected to - know the basic terminology in the field - be able to describe the environment (orally and in writing) - understand texts on nature's processes - know the necessary structures - be able to study in an international environment.
Contents	Basic environmental issues, such as air, water, soil, waste. Language of instruction: German.
Teaching Methods	Contact hours 14, independent work (online) approx. 38 hours. 2nd period (1 group). Spoken exercises during contact lessons once a week. Assignment through international online cooperation with students from European universities. Successfully completed written and spoken assignments or written and oral test. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Online exercises (http://www.uni-tuebingen.de/entecnet/) and handouts in class.
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A8000	***ENVIRONMENTAL TECHNOLOGY IN GERMAN 2 ECTS cr***
	Umwelttechnik
Year and Period	Period 3
Lecturer(s)	Lecturer, Jörg Wunderlich
CEF Level	B1
Aims	By the end of the course, students will - know the basic terminology in the field - be able to describe processes (orally and in writing) - understand texts on environmental technology - know the structures needed in technical language - be able to study in an international environment.
Contents	Online course and exercises on basic environmental technology. Topics: cleaning of flue gas and waste water, ground pollution, environmental biotechnology, waste management, biogas production. Language of instruction: German.
Teaching Methods	Contact hours 14, independent work (online) approx. 38 hours. 3rd period (1 group). Spoken exercises during contact lessons once a week. Assignment through international online cooperation with students in European universities. Successfully completed written and spoken assignments or written and oral test. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Online course and exercises: http://www.uni-tuebingen.de/entecnet/
Prerequisites	Facts about Finland and Germany or equivalent skills.

FV12A8400	GERMAN BUSINESS COMMUNICATION 3 ECTS cr
	Geschäftskommunikation
Year and Period	Period 3–4
Lecturer(s)	Lecturer Anneli Asunmaa, South Carelia Polytechnic Lecturer(s) responsible: Lecturer Jörg Wunderlich
CEF Level	B1
Aims	By the end of the course, students will - be able to communicate in German in a business environment - know basic terminology in the field - know the basic grammatical structures.
Contents	Spoken and written business communication, such as phone calls, negotiations, e-mails, letters. Topics: enquiry, call for tenders, tender, order, confirmation, complaint, reply to complaint. Language of instruction: Finnish.
Teaching Methods	Contact hours 48 (12x4): 3rd–4th period (1 group) Tuesdays 16–19 at South Carelia Polytechnic (Pohjolankatu 23) - written and oral exercises - pair work - listening comprehension exercises - distance work: 2 business letters, which will be graded Active participation and 75% attendance required.
Assessment	Writing skills 50%, oral skills 30%, continuous assessment 20%. Written and oral test. 0–5
Course Material	Provided by the teacher. Online course worth 1 ECTS credit.
Prerequisites	Business German/Facts about Finland and Germany or equivalent skills.

FV12A8600	BASICS OF MACROECONOMICS 3 ECTS cr
	Makroökonomie ganz einfach
	This course will not be taught in the academic year 2007–2008.
CEF Level	Entry level: B2.
Aims	Introduction to the language of macroeconomics.
Contents	Spoken and written exercises in economics terminology and structures. Language of instruction: German.
Teaching Methods	Contact hours 48 (24 + 24). Preparing and giving a presentation.
Assessment	Continuous assessment or written and oral test. Continuous assessment requires 75% attendance and active participation. 0–5. Written part 50%, oral 50%.
Course Material	Provided by the teacher.
Prerequisites	Business German or equivalent skills.

FV12A8800	NEGOTIATING IN GERMAN 2 ECTS cr
	Verhandlungssprache Deutsch
	This course will not be taught in the academic year 2007–2008.
CEF Level	Entry level: B2.
Aims	The ability to use essential German expressions in common negotiations.
Contents	Preparing for negotiations, their simulation and analysis. Language of instruction: German.
Teaching Methods	Contact hours 48 (12 + 12 + intensive session 24) Active participation or oral test. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5
Course Material	Provided by the teacher.

FV15A1200	*FRENCH 1*	*3 ECTS cr*
	Ranska 1	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Lecturer, David Erent Lecturer, 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 and their work - to use simple sentences on the telephone - to write short and simple e-mails and letters - to understand key words in a text related to topics discussed during the course - to use polite phrases and expressions typical of the French communication culture.	
Contents	Situations: introducing oneself, describing family, travelling, describing things Structures: verbs in the present and future tense, passé composé, articles, adjectives, prepositions of place, prepositions à and de, personal pronouns, structures expressing ownership, negations, questions, numerals Languages of instruction: French and Finnish. If there are exchange students in the group, they will get instruction in English, if needed.	
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24 + 24), independent study approx. 30 hours. 1st–2nd period(group A), 3rd–4th period (group B) Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.	
Assessment	Pass/fail. Written examination 50%, oral test or continous assessment 50%.	
Course Material	Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express, lessons 1-5.	

FV15A1400	*FRENCH 2*	*3 ECTS cr*
	Ranska 2	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Lecturer, David Erent	
CEF Level	Entry level: A1, target level: A2	
Aims	By the end of the course, students are expected - to cope in situations practised during the course - to be able to discuss topics introduced during the course - to fill out their personal information in a form and write a short and simple text related to topics discussed during the course - to understand the main idea of texts on topics discussed during the course - to understand and apply the most important French customs.	
Contents	Situations: talking about work, working place, environment and working day, presenting a company (very shortly), going to a bank, describing people, talking about past and future. Structures: verbs: imperfect, future, imperative, conditional, partitive structure, objects of personal pronouns, interrogative pronouns, demonstratives, comparative forms, relative pronouns Languages of instruction: French and Finnish. If there are exchange students in the group, they will get instruction in English, if needed.	
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24 + 24), independend study approx. 30 hours. 1st–2nd period (group A), 3rd–4th period (group B) Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.	
Assessment	Pass/fail. Written examination 50%, oral test or continuous assessment 50%	
Course Material	Béatrice TAUZIN, Anne-Lyse DUBOIS: Objectif Express, lessons 6–10.	
Prerequisites	French 1 or equivalent skills.	

FV15A1500	*FRENCH PRONUNCIATION* *2 ECTS cr*
	Ranskan ääntämiskurssi
Year and Period	Period 1 tai 2, 3–4
Lecturer(s)	Lecturer, Vuokko Paakkonen Lecturer, David Erent
CEF Level	Entry level: A1
Aims	By the end of the course, students are expected - to pronounce the sounds practised during the course correctly - to identify the sounds practised during the course based on the written form - to pronounce the parts of a spoken sentence according to french liaison rules - to apply the French intonation and rhythm rules in speech - to identify the sounds practised during the course in speech and utilize this in listening comprehension - to utilize the phonetic writing to support correct pronunciation - to identify mistakes in his/her own pronunciation and to correct them.
Contents	The French vowel and consonant sounds, of which the most important to the oral communication will be handled in more detail than others. The writing corresponding the sounds. Phonetic symbols. Liaison, rhythm and intonation. Languages of instruction: French or Finnish. If there are exchange students in the group, they will get instruction in English, if needed.
Teaching Methods	Group A: Practising pronunciation using mainly the Gattegno method. Pronunciation and listening comprehension exercises in language lab. Contact hours 28 (a weekend course; times will be set up with the students). Information session in the beginning of the 1st period. 1st or 2nd period (group A). Learning journal and approved exercises. Continuous assessment and the Gattegno method require 80% attendance and active participation. Group B: Pronunciation and listening comprehension exercises in language lab. Contact hours 28 (14+14), 3rd–4th period. Approved exercises. Continuous assessment (requires at least 50% attendance and active participation) or a final exam.
Assessment	Pass/fail. Group A: exercises and learning journal 50%, continous assessment 50%. Group B: exercises 50%, continous assessment or the final exam 50%
Course Material	Provided by the teacher. Additional material available in the self-access centre of the language centre.

FV15A1600	*FRENCH FOR WORKING LIFE* *3 ECTS cr*
	Työelämän ranskaa
Year and Period	Period 1–2, 3–4
Lecturer(s)	Lecturer, David Erent
CEF Level	Entry level: A2, target level: B1
Aims	By the end of the course, students are expected to be able - to talk about themselves as employees - to talk about work and the working environment both in face-to-face situations and on the phone - to communicate in situations related to work and travelling - to write work related e-mails and official letters - to understand the main points of general texts on the world of work - to understand and apply the most important French work related customs.
Contents	Situations: visitors at the working place, organising meetings, talking about working conditions, describing simple manufacturing processes, explaining the function of a machine, communication in work-related travelling (using public

	transport, getting to know a city, hotel and restaurant situations), visiting a doctor, using e-mail, using telephone, writing letters Structures: different prepositions, relative pronouns, the present tense, passé composé and future, the passive, the indirect speech Languages of instruction: French
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24 + 24), independent study approx. 30 hours. 1st–2nd period (group A), 3rd–4th period (group B). Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5 Written examination 50%, oral test or continuous assessment 50%
Course Material	Jean-Luc PENFORNIS: français.com, lessons 1–5
Prerequisites	French 2 or equivalent skills.

FV15A4000	***SUGGESTOPEDIC FRENCH COURSE***	***2 ECTS cr***
	Suggestopedinen ranska	
Year and Period	Period 1 tai 2	
Lecturer(s)	Lecturer, Vuokko Paakkonen	
CEF Level	Student level entering the course: A2/B1	
Aims	By the end of the course, students are expected to be able - to communicate orally in changing and even suprising general language situations - to understand speech of various subjects on general language level - to communicate orally more unreservedly and spontaneously than in the beginning of the course - to encounter new situations and methods more boldly - to utilize suggestopedic learning method in self-study or studying other subjects	
Contents	Subjects: mainly communicating orally in the common everyday situations of the basic French courses, using the suggestopedic method. The extended vocabulary related to these situations. Languages of instruction: French	
Teaching Methods	Pair and group work, using roles, relaxation, exercises improving creativity. Contact hours 28. This is a weekend course the times of which will be agreed upon with the students. Information session in the beginning of the 3rd period. 1st or 2nd period (1 group). Learning journal. Continuous assessment and the suggestopedic method require 80% attendance and active participation.	
Assessment	Pass/fail.	
Course Material	Provided by the teacher.	

FV15A5000	***BUSINESS FRENCH***	***3 ECTS cr***
	Français de l'entreprise	
Year and Period	Period 1–2	
Lecturer(s)	Lecturer, David Erent	
CEF Level	Entry level: B1	
Aims	By the end of the course, students are expected to be able - to give a presentation in French - to follow actively oral presentations - to describe a company - to talk about various tasks and responsibilities in a company - to communicate both orally and in writing when applying for a job - to understand work-related texts - to understand and apply the most important French work-related customs.	
Contents	Situations: describing a company, applying for a job (advertisement, letter of application, CV, job interview). Oral presentation.	

	Structures: comparative forms, structures expressing condition or presumption, the harmony of tenses, indirect speedh, adverbs, the past perfect, subjunctive, passé simple, past tense conditional Languages of instruction: French
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24 + 24), independent study approx. 30 hours. 1st–2nd period (1 group). Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.
Assessment	0–5, written examination 50%, oral test or continuous assessment 50%
Course Material	Jean-Luc PENFORNIS: français.com, lessons 6–10
Prerequisites	French for Working Life or equivalent skills.

FV15A5500	***SUGGESTOPEDIC COURSE IN BUSINESS FRENCH*** ***2 ECTS cr***
	Yrityselämän ranskaa suggestopedian avulla
Year and Period	Period 3 tai 4
Lecturer(s)	Lecturer, Vuokko Paakkonen
CEF Level	Entry level: B1
Aims	By the end of the course, students are expected to be able - to communicate orally in changing and even suprising situations of work-related situations - to understand speech containing various subjects in work-related situations - to communicate orally more unreservedly and spontaneously than in the beginning of the course - to encounter new situations and methods more boldly than before - to utilize suggestopedic learning method in self-study or studying other subjects.
Contents	Subjects: mainly the same situations as in the courses French for Working Life and Français de l'entreprise, communicating orally using the suggestopedic method. The most important structures and the slightly extended vocabulary of the former mentioned courses. Languages of instruction: French
Teaching Methods	Pair and group work, using roles, relaxation, exercises improving creativity. Contact hours 28. This is a weekend course the times of which will be agreed upon with the students. Information session in the beginning of the 3rd period. 3rd or 4th period (1 group) Learning journal. Continuous assessment and the suggestopedic method require 80% attendance and active participation.
Assessment	Pass/fail.
Course Material	Provided by the teacher.
Prerequisites	French for Working Life or equivalent skills.

FV15A6000	***FINLAND IN FRENCH – INTERCULTURAL COURSE*** ***4 ECTS cr***
	La Finlande en français - cours interculturel **This course is suitable for French students, too.**
Year and Period	Period 3–4
Lecturer(s)	Lecturer, David Erent
CEF Level	Entry level: B1
Aims	By the end of the course, Finnish students are expected - to describe Finland, Finnish people and culture to a French person paying attention to the characteristics of the French culture - to apply the interactive skills exercised during the course when meeting a new culture.

	By the end of the course, French students are expected - to know Finland, Finnish people and Finnish culture in general terms and to pay attention to the characteristics of the Finnish culture when communicating with a Finn - to apply the interactive skills exercised during the course when meeting a new culture.
Contents	Finland related subjects 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.
Teaching Methods	Contact hours 48 (24 + 24). independend study (incl. group work) approx. 60 hours. 3rd–4th period (1 group). Approved exercises and continuous assessment, requires 75% attendance and active participation.
Assessment	0–5
Course Material	Provided by the teacher and the students.

FV16A1200	***SPANISH 1***	***3 ECTS cr***
	Espanja 1	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Lecturer, Sari Pärssinen Lecturer, Javier Gonzalez Garcia	
CEF Level	Entry level: 0, target level: A1	
Aims	By the end of the course, students are expected to use the basic structures and vocabulary needed in the communication situations of the working and student life, and the polite phrases and expressions typical of the Spanish communication culture.	
Contents	Introducing oneself, professions, introduction, hobbies, living. Structures: pronouns, substantives, adjectives and the present tense. Languages of instruction: Finnish and Spanish	
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24+24), independend study approx. 30 hours. 1st–2nd period: groups A–B, 3rd–4th period: groups C–E Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.	
Assessment	Pass/fail.	
Course Material	Es español (lessons 1–7)	

FV16A1400	***SPANISH 2***	***3 ECTS cr***
	Espanja 2	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Lecturer, Sari Pärssinen Lecturer, Javier Gonzalez Garcia	
CEF Level	Entry level: A1	
Aims	By the end of the course, students are expected to be able to use the structures and vocabulary needed in the communicative situations of the working and every-day life, to talk about the past and understand and apply the most important Spanish customs.	
Contents	On the phone, free time, expressing an opinion, talking about the past, working history, future plans. Structures: object pronouns, past tenses the future. Languages of instruction: Finnish and Spanish	
Teaching Methods	Exercises that support communication skills. Contact hours 48, independend study approx. 30 hours. 1st–2nd period: groups A and B, 3rd–4th period: groups C and D Written examination. Oral test or grade based on continuous assessment.	

	Continuous assessment requires 75% attendance and active participation.
Assessment	Pass/fail.
Course Material	Es español 1 (lessons 8–12)
Prerequisites	Spanish 1 or equivalent skill.

FV16A1600	***SPANISH FOR WORKING LIFE***	***3 ECTS cr***
	Työelämän espanjaa	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Lecturer, Sari Pärssinen Lecturer, Javier Gonzalez Garcia	
CEF Level	Entry level: A2	
Aims	By the end of the course, students are expected to be able to use the structures and vocabulary needed in the work related communication situations, and to understand and apply the most important Spanish customs.	
Contents	Expressing opinion, applying for a job, invitation, meeting, presenting a company, organisational structure, company culture. Structures: subjunctive, conditional, indirect speech. Languages of instruction: Finnish and Spanish.	
Teaching Methods	Exercises that support communication skills. Contact hours 48, independent study approx. 30 hours. 1st–2nd period: groups A and B, 3rd–4th period: group C Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.	
Assessment	Pass/fail.	
Course Material	Materials provided by the teacher and available through WebCT.	
Prerequisites	Spanish 2 or equivalent skills.	

FV16A2200	***FACTS ABOUT SPAIN***	***1 - 3 ECTS cr***
	Datos sobre España	
Year and Period	Period 3-4	
Lecturer(s)	Lecturer, Javier Gonzalez Garcia	
CEF Level	Entry level: A2	
Aims	By the end of the course, students are expected to be familiar with Spain and Spanish culture, as well as with the geography, history, society and economy of Spain.	
Contents	Diversified introduction of Spain: Spanish history, culture, art, society, economy, politics, broadcasting principles and current issues, as well as the presence and meaning of the Spanish language in the whole world. The emphasis of this course is on listening comprehension and writing. Languages of instruction: Spanish	
Teaching Methods	Continuous assessment or a written examination. Continuous assessment requires 75% attendance and active participation and successfully completed written and listening assignments.	
Assessment	Pass/fail.	
Prerequisites	Spanish for Working Life or equivalent skills.	

FV16A5200	***INTERCULTURAL COURSE FOR FINNISH AND SPANISH STUDENTS***	***4 ECTS cr***
	Curso intercultural entre Finlandia y España **The course is offered every other academic year. The course will be organised in this form if the amount of Spanish exchange students enrolled on it is high enough.**	

Year and Period	Period 1–2
Lecturer(s)	Lecturer, Javier Gonzalez Garcia
CEF Level	Entry level: B1
Aims	By the end of the course, students are expected to be able to describe the Finns, Finland and Finnish culture in Spanish, and to compare these issues to the Spanish ones.
Contents	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 the cultural cooperation. Languages of instruction: Spanish
Teaching Methods	The teacher will lead the discussion and comparison of the cultures with the Spanish exchange students. Students will give a presentation in pairs, in which they compare Finnish and Spanish cultures. Contact hours 48 (24 + 24) + independend study approx. 30 hours. 1st–2nd period (1 group) Continuous assessment (requires 75% attendance and active participation).
Assessment	Pass/fail.
Course Material	Handouts in class.
Prerequisites	Spanish for Working Life or equivalent skills.

FV17A1200	***PORTUGUESE 1***	***3 ECTS cr***
	Portugali 1, Português 1 **This course is offered every other year.**	
Year and Period	Period 1–2	
Lecturer(s)	Lecturer, Sari Pärssinen	
CEF Level	Entry level: 0, target level: A1	
Aims	By the end of the course, students are expected to be able to use the basic structures and vocabulary needed in communication situations of the working and student life, and to use the polite phrases and expressions typical of the Brasilian communication culture.	
Contents	Introducing oneself, professions, hobbies, living, introduction, meeting, telephone conversation Pronunciation, basic vocabulary, nouns, adjectives, verbs in the present tense, past tenses Languages of instruction: Finnish and Portuguese	
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24+24), independent study approx. 30 hours. 1st–2nd period (1 group) Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.	
Assessment	Pass/fail.	
Course Material	Diálogo Brasil: Curso Intensivo de Português para Estrangeiros.	

FV17A1400	***PORTUGUESE 2***	***3 ECTS cr***
	Portugali 2, Português 2 **The course is offered every other year.**	
Year and Period	Period 3–4	
Lecturer(s)	Lecturer, Sari Pärssinen	
CEF Level	target level: A1	
Aims	By the end of the course, students are expected to be able to use the structures and vocabulary needed in the communication situations of the working and student life, and to understand and apply the most important Brasilian customs.	
Contents	Telling about the past, presenting a city, free-time	

	Structures: past tenses, future, object pronouns. Languages of instruction: Finnish and Portuguese
Teaching Methods	Exercises that support communication skills. Contact hours 48 (24+24), independent study approx. 30 hours. 3rd–4th period (1 group) Written examination. Oral test or grade based on continuous assessment. Continuous assessment requires 75% attendance and active participation.
Assessment	Pass/fail.
Course Material	Diálogo Brasil: Curso Intensivo de Português para Estrangeiros.
Prerequisites	Portuguese 1 or equivalent skills.

FV18A9100	***FINNISH FOR FOREIGNERS 1***	***2 ECTS cr***
	Finnish for Foreigners 1	
Year and Period	Period 1, 3	
Lecturer(s)	Lecturer, N. N.	
CEF Level	A1.1	
Aims	After the course the student is able 1. to cope orally in very simple everyday situations 2. to understand very simple spoken Finnish 3. to read very simple texts with the help of a dictionary.	
Contents	The phonetic, intonation and orthographic systems of the Finnish language, plus basic structures, notions and vocabulary.	
Teaching Methods	Pronunciation, listening and speaking will be practised by means of pair and group work plus other similar activities. Lessons 28, homework 26 hours. Period 1: groups A + B (for the departmental international master's degree programs), groups C + D (for the exchange students) Period 3: group E + F (for the exchange students) A written examination.	
Assessment	0–5	
Course Material	Handouts given in class.	
Prerequisites	No previous knowledge of the Finnish language is expected.	

FV18A9200	***FINNISH FOR FOREIGNERS 2***	***2 ECTS cr***
	Finnish for Foreigners 2	
Year and Period	Period 2, 4	
Lecturer(s)	Lecturer, N. N.	
CEF Level	A1.1	
Aims	After the course the student is able 1. to communicate orally in very simple everyday situations 2. to understand simple spoken Finnish 3. to read simple texts with the help of a dictionary 4. to write simple sentences in Finnish	
Contents	The course will broaden the already learnt grammar and increase the vocabulary (for example expressions).	
Teaching Methods	Simple literary texts will be studied both in class and as homework. In the classroom the newly learnt language material will be practiced by means of pair and group work plus other similar activities. Lessons 28, homework 26 hours. Period 2: group A (for the departmental international master's degree programs), group B (for the exchange students) Period 4: Group C A written examination.	
Assessment	0–5	
Course Material	Handouts given in class.	
Prerequisites	Finnish for Foreigners 1 or corresponding knowledge.	

FV18A9300	FINNISH FOR FOREIGNERS 3	2 ECTS cr
	Finnish for Foreigners 3	
Year and Period	Period 3-4	
Lecturer(s)	Lecturer, N. N.	
CEF Level	A1.2	
Aims	After the course the student is able to 1. cope orally also in a simple conversation 2. understand also more advanced Finnish conversations 3. use more grammatical structures, e.g. past tense.	
Contents	The course includes new grammatical topics and gives the students more tools to have a conversation in Finnish. The previously learnt vocabulary will be broadened.	
Teaching Methods	Texts with some new vocabulary and grammatical structures will be studied in class and as homework. Different kinds of spoken situations will be practiced. There will be lectures on grammar as well as different written grammar exercises. Lessons 28, homework 26 hours. A written exam.	
Assessment	0–5	
Course Material	Handouts given in class.	
Prerequisites	Finnish for Foreigners 1 and 2 or corresponding knowledge.	

FV18A9800	GERMAN-FINNISH LINGUAL AND CULTURAL TANDEM	1 ECTS cr
	German-Finnish Lingual and Cultural Tandem	
Year and Period	Period 1, 3	
Lecturer(s)	Lecturer, Karita Riekko Part-time Untenured Teacher, Elina Häkkinen	
CEF Level	A1–C2	
Aims	By the end of the course - the student will be able to discuss and reflect on cultural aspects between the German and Finnish cultures - it is hoped that the student has developed his/her Finnish language skills.	
Teaching Methods	Contact teaching 4 hours. Work in pairs 24 hours. The course can be completed during either one or two semesters. A learning diary will be required. The teacher will announce the time of the first meeting by e-mail.	
Assessment	Pass/Fail.	

FV19A1000	CHINESE 1	3 ECTS cr
	Chinese 1	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Matina Ma	
CEF Level	A1.1	
Aims	By the end of the course students will be able • to read and write Chinese phonetics, • to make simple sentences, • to produce simple everyday greetings, • to use a Chinese dictionary.	
Contents	Students will learn Chinese phonetics through speaking and listening in the first period. In the second period, students will work on Chinese characters and develop a basic knowledge of sentence structure. Topics include greetings, numbers and time, introduction of self and family. Language of instruction: English and Chinese.	
Teaching	56 contact hours, meeting three times a week. Each lesson lasts one full hour.	

Methods	1st–2nd period, groups A and B 3rd–4th period, groups C and D 75% attendance and written exams or oral exams are the basis for assessment.
Assessment	0–5
Course Material	Provided by the teacher.
Prerequisites	The course is meant for beginners.

FV19A2000	***CHINESE 2***	***3 ECTS cr***
	Chinese 2	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Matina Ma	
CEF Level	A1.2	
Aims	By the end of the course students will • 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 dialogues provided that the speakers speak slowly, • be able to speak independently on simple topics.	
Contents	Topics include traveling and shopping in Chinese communities, personal information and employment, daily schedule, family and interests. Language of instruction: English and Chinese.	
Teaching Methods	56 contact hours, meeting three times a week. Each lesson lasts one full hour. 1st–2nd period (group A), 3rd–4th period (group B). 75% attendance and written exams or oral exams are the basis for assessment.	
Assessment	0–5	
Course Material	Provided by the teacher.	
Prerequisites	Successful completion of FV19A1000 Chinese 1 / Ki7190100 Beginning Chinese 1, or possession of equivalent skill level.	

FV19A3000	***CHINESE FOR WORKING LIFE 1***	***3 ECTS cr***
	Chinese for Working Life 1	
Year and Period	Period 1–2, 3–4	
Lecturer(s)	Matina Ma	
CEF Level	A2.1	
Aims	By the end of the course students will • be able to read articles on topics dealt with in the course • know essential Chinese modern grammar • be able to exchange ideas with native speakers on topics concerning school and social life provided that the speech is relatively slow and clear • understand some aspects of Chinese culture.	
Contents	Topics include Chinese table manners, an introduction to business Chinese, a Chinese modern wedding and Finland in Chinese. Language of instruction: English and Chinese.	
Teaching Methods	56 contact hours, meeting three times a week. Each lesson lasts one full hour. 1st–2nd period (group A), 3rd–4th period (group B). 75% attendance and written exams or oral exams are the bases for assessment.	
Assessment	0–5	
Course Material	Provided by the teacher.	
Prerequisites	Successful completion of FV19A2000 Chinese 2 / Ki7190200 Beginning Chinese 2, or possession of equivalent skill level.	

FV19A4000	*CHINESE FOR WORKING LIFE 2*	*3 ECTS cr*
	Chinese for Working Life 2	
Year and Period	Period 3–4	
Lecturer(s)	Matina Ma	
CEF Level	A2.2	
Aims	By the end of the course students will • have a sufficient command of understanding points of advertisements, short and simple everyday texts from Chinese magazines and newspapers. • be able to communicate with native speakers on topics concerning social life and travel in China. • know essential Chinese modern grammar • be able to write personal letters describing self relevant matters. • further understand some aspects of Chinese culture.	
Contents	Topics include Chinese communities, cities and local geography, introduction of essential Chinese values, the impact of religion in China. Language of instruction: English and Chinese.	
Teaching Methods	56 contact hours, meeting three times a week. Each lesson lasts one full hour. 3rd–4th period (1 group). 75% attendance and written exams or oral exams are the bases for assessment.	
Assessment	0–5	
Course Material	Provided by the teacher.	
Prerequisites	Successful completion of FV19A3000 Chinese Language and Culture 1 / Ki7190300 Beginning Chinese 3, or equivalent knowledge of Chinese.	

15 How to Prepare a Master's Thesis in Technology

The following instructions on preparing a Master's thesis, issued by the vice-rector, are observed at Lappeenranta University of Technology. The instructions have been updated on 11 June 2007. **Faculties may also give their own instructions for the Master's thesis.**

The Master's thesis is the final project of the Master's degree studies. It demonstrates the student's knowledge of a scientifically or socially important topic related to his or her professional field. It is an advanced research assignment which requires approximately 6 months of work and is worth 30 ECTS credits or 20 credit units in the old degree (for students who complete the old 180-credit unit degree, the thesis is entered into the records in credit units). The student must demonstrate the ability to carry out the project independently and following a plan. The student also takes a maturity test on the topic of the Master's thesis and prepares a written report according to instructions.

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

Starting the Work

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

Especially the following points should be reviewed:

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

Topic, Supervisors and Examiners of the Master's Thesis

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

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

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

The following requirements for the approval the thesis topic apply to **students who complete the old M.Sc. (Tech.) degree (180 credit units)**:

- a minimum of 140 credit units completed for the degree
- **basic studies completed**
- compulsory internship 6 credit units
- the student must have received a grade of 3 or higher for the intermediate or advanced course related to the research field of the thesis, **or** in the Department of Industrial Management, a grade of 3 or higher for an advanced course in the student's field of specialisation included in the degree.

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

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

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

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

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

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

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

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

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

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

Maturity Test

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

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

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

The maturity test is evaluated pass/fail.

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

Examination and Evaluation of the Master's Thesis

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

The student provides the examiners each with their own, bound copy. In addition, the student leaves the assessment application, abstracts in Finnish and English and a third bound copy of the Master's thesis with the faculty's administrative staff. Foreign students do not need to prepare an abstract in Finnish. **The faculty decides on the meeting dates and deadlines, by which the student must submit the above-mentioned material to the examiners and faculty administration.**

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

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

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

Master's theses are graded on the following scale:

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

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

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

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

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

Public Access to the Master's 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**. In such cases, the commissioner must provide the university in writing with the reasons for confidentiality.

If the commissioner requires a period of confidentiality which is longer than two years, a version excluding the confidential information must be submitted for publication.

The supervising professor of the thesis must see to it that the commissioner is aware of the restrictions to confidentiality in the very beginning of the discussions.

Confidential theses are handled in the faculty council meeting following normal procedure.

If the thesis includes a public part and a confidential part, both are discussed in the faculty council meeting. The public version of the Master's thesis must mention that the thesis also includes a confidential part.

Faculty council members are liable for keeping the information confidential, and the agenda and minutes of the meeting are not to include anything in violation of this confidentiality. The period of confidentiality shall be mentioned in the minutes of the meeting.

The faculty sees to it that students are aware of the maximum period of confidentiality.

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

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

Writing a Thesis

The Master's thesis is a written report on the research work involved, presenting the stages of the work, the methods, results and explanations. The format of the thesis is based on commonly applied

Finnish standards and guides (e.g. Tirronen K., 1987). In accordance with these instructions, the following format is applied at Lappeenranta University of Technology:

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

On the front cover, printed in gold (*painokulta*), font Times or equivalent:
- MASTER'S THESIS (centred, bottom margin 200 mm, font size 44pt) and
- Author's name and year of publication (lower right-hand corner, bottom and right margin 30-35 mm, font size 22 pt).
  Another alternative is the cover recommended by LUT's publication committee, including the university's logo in gold in the upper left-hand corner. Further instructions on the cover format recommended by the publication committee are available on the university web site.

On the spine, printed in gold (*painokulta*), font Times or equivalent:
- MASTER'S THESIS (left alignment, left margin 40 mm)
- Author's name
- Year of publication (right alignment, right margin 30 mm)

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

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

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

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

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

The title page is the first, unnumbered page of the thesis. **The faculty decides on the information presented on the title page. However, the following is always included:**
- university, faculty, degree programme
- title of the thesis
- examiners and supervisors of the thesis
- date and signature of the author
- author's address and telephone number

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

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

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

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

Finnish abstract:	English abstract:
TIIVISTELMÄ (in bold font)	**ABSTRACT (in bold font)**
Lappeenrannan teknillinen yliopisto * Faculty * * Degree Programme *	Lappeenranta University of Technology * Faculty in English * * Degree Programme in English *
* Author's name *	* Author's name *
*** Thesis title in Finnish *** **(in bold font)**	*** Thesis title in English *** **(in bold font)**
Master's thesis	Master's thesis
* Year of publication *	* Year of publication *
* Number of pages, figures, tables and appendices * (xx sivua, xx kuvaa, xx taulukkoa ja xx liitettä)	* Number of pages, figures, tables and appendices * (xx pages, xx figures, xx tables and xx appendices)
Examiners: Professori * name * Professori * name *	Examiners: Professor * name * Professor * name *
Hakusanat: Keywords:	Keywords:

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

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

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

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

Decimals and indentations are used in the table of contents – as well as in the headings in the text – according to the following example. If variables need to be used in the first-level headings, they are to be written out as they are in equations. In such cases the author and the supervising professor

may decide on the most appropriate way to present the headings in order to obtain a neat and legible layout.

TABLE OF CONTENTS

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

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

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

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

The language of the thesis must be grammatically correct and the expression coherent, accurate and concise. The topic must be presented to the reader unequivocally, intelligibly and consistently. The style must be academic and the technical terminology established. In particular, the use of

foreign words should be avoided. They should be replaced with paraphrases or expressions in the language of the thesis.

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

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

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

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

$$\boldsymbol{D_1} = \varepsilon \boldsymbol{E_1}.$$

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

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

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

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

In the author-date system (the Harvard system) the reference list is alphabetised according to the first author of the source. If several sources by the same author or group of authors are referenced, they are listed in order of publication. When referencing several sources published by an author

within the same year, they are distinguished from each other with a lower case letter after the publication year (1999a, 1999b etc.). If the author is unknown, the abbreviation Anon. can be used instead of the author's name. Alternatively, the name of the publication can be used as the reference.

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

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

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

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

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

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

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

An example of the correct use of subscripts and variables: 1 Appendix I, 1
Appendix I, 2 etc.

An example of the correct use of subscripts and variables: 2 Appendix 1. Heading

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

Appendix pages are not numbered.

Useful Sources for the Author of a Master's Thesis

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

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

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

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

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

Itkonen, T. (revised by Sari Maamies), 2000. Uusi kieliopas. Helsinki, Tammi. 456 p. ISBN 951-31-1716-2

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

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

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

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

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

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

Finnish Standards on Writing and Presentation

SFS 3655. Suureet ja yksiköt. Suurenimet, tunnukset ja yksiköt. 2nd ed. 1982.

SFS 3855. Tiivistelmien laatiminen ja käyttö. 1978.

SFS 4004. Suureet ja yksiköt. Alaindeksit 2nd ed. 1992.

SFS 5342. Kirjallisuusviitteiden laatiminen. 2nd ed. 1992.

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

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

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

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

Internet Sources

The Finnish Terminology Centre TSK	www.tsk.fi
Research Institute for the Languages of Finland	www.kotus.fi
Finnish Standards Association SFS	www.sfs.fi

Ilkka Pöyhönen
Vice-Rector

16 How to Prepare a Master's Thesis in Business Administration

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

The Master's thesis is the final project of the Master's degree studies. It demonstrates the student's knowledge of a scientifically or socially important topic related to his or her professional field. It is an advanced research assignment including a seminar which requires approximately 6 months of full-time work and is worth 30 ECTS credits, or 20 credit units in the old degree (for students who complete the old 160-credit unit degree, the thesis is entered into the records in credit units). The student must demonstrate the ability to carry out the project independently and following a plan. The student also takes a maturity test on the topic of the Master's thesis and prepares a written report according to instructions.

Starting the Master's Thesis

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

Especially the following points should be reviewed:

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

General Comments

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

The seminar is completed in the second year of the Master's degree studies, and participation requires the completion of a Bachelor's thesis (this applies only to students who are completing the new degree in accordance with the 2005 decree). Major subjects may also have their own, additional requirements, which are listed in the degree requirements. Students should study them carefully. The extent of the thesis and seminar is 30 ECTS credits / 20 credit units.

Language of the Master's Thesis

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

Applying for a Topic

The degree of Bachelor of Science (Economics and Business Administration) should be completed (this does not apply to students admitted directly into a Master's programme) along with possible complementary studies (this applies only to students completing the new degree in accordance with the 2005 decree).

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

The student asks the examiners to sign the application and submits it to the study coordinator. The student's individual study plan is attached to the application, which is then reviewed by the study coordinator. The application form, instructions and deadlines are available at www.lut.fi/kati/opiskelu.php or from the study coordinator.

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

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

Maturity Test

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

If a student has demonstrated his or her language skills in connection with the Bachelor's degree or other previous university degree, the language of the maturity test will not be evaluated, only the contents. In such cases, the head of the degree programme may decide to allow the student to substitute the presentation given in the thesis seminar for the maturity test. If a student has not passed the maturity test in the Bachelor's degree or in another previous university degree (or if the student completes the 160-credit unit Master's degree in accordance with the old degree structure), he or she must take a supervised maturity test. No reference material is allowed and both the contents and language will be evaluated.

The maturity test may also be written on a computer. Further details at www.lut.fi/fi/opiskelu/nykyiset_opiskelijat/kuulustelut/kypsyysnayte.html.

The test must be taken at least four weeks before graduation. The supervisor/examiner will determine the earliest possible date for taking the test. The date is set together with the examiner and the faculty office (practical arrangements by Office Secretary Irma Sihvo). The examiner gives the topic of the test.

The maturity test is evaluated pass/fail.

Further information in the study guide of the LUT Language Centre.

Assessment of the Master's Thesis

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

The student turns in the final, printed version of the Master's thesis bound in black covers to the examiners (one for each) at least 14 calendar days before the faculty council meeting where the thesis is up for approval. Also an application for evaluation, abstracts in Finnish and English, a possible request for confidentiality from the commissioner of the thesis, and a third copy bound in black covers are to be submitted to the study coordinator **at least 14 calendar days before the above-mentioned faculty council meeting**.

The examiners prepare a written statement on the thesis along with a grade proposal for the faculty council. The title of the thesis, the grade and the names of the examiners are indicated in the degree certificate. If the thesis is written by several authors, the sections prepared independently by each author are evaluated separately. The grade of the Master's thesis does not affect the overall grade for the major subject.

The faculty council evaluates and approves the Master's thesis upon application. Forms, deadlines and faculty council meetings are available at: www.lut.fi/kati/opiskelu.php

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

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

Assessment Criteria

Purpose and Delimitation of the Research

- Objectives, definitions and delimitation
- Relationship to previous research

Stages of the Research

- Formulation of concepts, models, hypotheses and frameworks
- Data collection
- Collection of additional material and analysis
- Discussion, interpretation and conclusions

Management of the 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 readability

Assessment Scale

- improbatur (fail)
- approbatur (lowest passing grade)
- lubenter approbatur
- non sine laude approbatur
- cum laude approbatur

- magna cum laude approbatur
- eximia cum laude approbatur
- laudatur (highest grade)

The student has completed his/her degree **with distinction** if the overall grade is at least 4 and the Master's thesis grade at least eximia cum laude approbatur. In addition to this, at least 40 credits included in the degree must be carried out at LUT and graded on a scale of 1–5.

Publicity of the Study

Master's theses submitted to the university for examination are normally public documents.

This must be mentioned to the commissioner when the topic of the thesis is first discussed. If the thesis includes information which the commissioner considers confidential, the university may agree to hold the thesis **confidential for a maximum of two years**. The confidentiality starts from the date the faculty council assesses the thesis. In such cases, the commissioner must provide the university with a written, free-form explanation for why confidentiality is required.

If the commissioner requires a period of confidentiality which longer than two years, another version excluding the confidential information must be submitted for publication.

The supervisor of the thesis must see to it that the commissioner is aware of the restrictions for confidentiality at the very beginning of the discussions.

Confidential theses are handled in the faculty council meeting following normal procedure. The faculty council must also have access to the confidential part. The public version of the Master's thesis must mention that the thesis also includes a confidential part. Faculty council members are liable for keeping the information confidential, and the agenda and minutes of the meeting are not to include anything in violation of this confidentiality. The period of confidentiality is to be mentioned in the minutes of the meeting.

In accordance with the faculty council decision of 15 March 2005, this rule can be applied to all Master's theses for which the topic application has been submitted after 1 March 2005.

The only exception are theses with a confidentiality period longer than two years if it was agreed on by the employer and supervising professor (or adjunct professor) at an earlier date. Such cases should always be discussed with the supervising (adjunct) professor.

Notice of Confidentiality

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

The Master's thesis will include the mention "Confidential" and the date the confidentiality expires in the lower right-hand corner of the title page.

Chapters and Layout

The language of the thesis must be grammatically correct and the expression coherent, accurate and concise. It should convey the message to the reader unequivocally and intelligibly, and the organisation should be logical and coherent. Say only what is needed, avoid wordiness. You should particularly avoid buzzwords and unnecessary foreign words.

The Master's thesis is bound in black, hard covers, size A4. The recommended font is Arial 12. The thesis can be printed on both sides of the paper or on one side only. Page margins are as follows: 35 mm at the top, approx. 50 mm on the left, and in one-sided printing approx. 20 mm on the right and at the bottom. Page numbering is at the top of the page, either centred or right-aligned. Spacing is 1.5. If you print on both sides of the paper, the outer margins should be approx. 20 mm and the inner ones approx. 50 mm. Each paragraph is aligned to the left, there are no indentations and there is an empty line between paragraphs. The paragraphs are justified. Avoid long spaces between words: use hyphenation. The thesis should be approximately 80-100 pages.

The text "Master's thesis", the author's name and the year are printed in gold on the spine. The text starts 80 mm from the top and the year is 30 mm from the bottom.

On the front cover, in gold, centred and approx. 100 mm from the top is the word *Master's thesis*. The author's name and the year are in the lower right-hand corner.

LUT's publication committee recommends that the university's logo be printed in gold in the upper left-hand corner of the cover. A cover template recommended by the publication committee is available on the university web site at www.lut.fi/fi/opiskelu/nykyiset_opiskelijat/ohjeita_opiskeluun.html and in printing presses in Lappeenranta.

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

Instructions for Layout and Presentation

The parts of the thesis are organised as follows:

Title page

The title page contains the following information:

University, faculty, major subject
Title of the Master's thesis
Examiners (supervisor first)
Date and signature of the author
Address and telephone (optional)
Possible period of confidentiality (lower right-hand corner). The confidentiality period starts from the date the faculty council assesses the thesis.

The title must be well-defined and it must 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 words: some, review, method, report, study, equipment etc.

Abstracts in Finnish and English

The abstract is a concise, objective, independent presentation which can be published separately. It should be intelligible as such, without the original document. It explains the contents of the thesis: the objective, methodologies, results and conclusions. The main method, novel results and observations, practical importance or theoretical novelty should be presented. The organisation does not need to follow that of the thesis; e.g. the most important result can be introduced upfront. The abstract is no longer than one page. Use short, complete sentences.

The abstract is done in both Finnish and English (equivalent contents). In the Finnish abstract, the title is in Finnish and in the English one in English. Foreign students do not need to prepare an abstract in Finnish.

The wordcount is approximately 100. Both the Finnish and English abstracts are attached to the thesis. They are also submitted to the study coordinator along with the assessment application.

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

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

You should favour the passive voice or the 3rd person active in case the abstract is published separately. Unestablished abbreviations, symbols or technical terms should be explained. Tables, equations etc. are used only if they are necessary for the sake of clarity. No direct references are made to the original text.

The information below is given at the beginning of the abstract in the following order:

Author's name
Title
Faculty
  Major Subject
Year of publication
Master's Thesis. University.
Number of pages, figures, tables and appendices
Examiners (supervisor first)
Keywords in Finnish
Keywords in English

An example of how to present the bibliographic information in the abstract:

Finnish abstract:

TIIVISTELMÄ

Tekijä:	Markkanen, Marja
Tutkielman nimi:	Toimintolaskenta palveluyrityksessä
Tiedekunta:	Kauppatieteellinen tiedekunta
Pääaine:	**Laskentatoimi**
Vuosi:	2000
Pro gradu –tutkielma:	Lappeenrannan teknillinen yliopisto 80 sivua, 26 kuvaa, 4 taulukkoa ja 8 liitettä
Tarkastajat:	prof. Timo Tietäväinen prof. Tiina Tietäväinen
Hakusanat:	toimintolaskenta, palveluyritys, toimintojohtaminen
Keywords:	activity based costing, service enterprise, cost management

English abstract:

ABSTRACT

Author:	Markkanen, Marja
Title:	Title in English
Faculty:	LUT, School of Business
Major:	**Accounting**
Year:	2000
Master´s Thesis:	Lappeenranta University of Technology 80 pages, 26 figures, 4 tables and 8 appendices
Examiners:	Prof. Timo Tietäväinen Prof. Tiina Tietäväinen
Keywords:	activity based costing, service enterprise, cost management

The keywords must be informative and describe the contents of the thesis accurately. Concrete concepts (e.g. equipment) are in plural, abstract ones (e.g. methods) in singular. A good title should include at least some of the most important keywords. The number of keywords should be three to five.

Acknowledgements

Possible acknowledgements recognise the help, guidance, advice etc. provided by others and give thanks to them. Also the commissioner of the thesis is mentioned.

Table of Contents

The table of contents lists the headings and sub-headings and their page numbers. The pages are numbered in Arabic numerals from where the text starts. A separate list of figures and tables can be included at the end of the table of contents.

Decimals and indentations are used in the table of contents – as well as in the headings in the text – according to the following example (note the use of upper and lower case lettering and the indentation of sub-headings). The page numbers are aligned to the right.

TABLE OF CONTENTS

Explanation of Abbreviations and Symbols

Abbreviations and variables and their explanations can be listed in alphabetical order, mathematical and other symbols as a list of their own, and identifying letters as yet another list (Latin, Greek etc. each separately).

Introduction

The introduction contains an introduction to the topic, definition of the research problem, objectives, point of view, delimitation and research methodology. Different parts can be presented as separate subsections.

Discussion

The discussion is divided into chapters with headings that depict the organisation of the thesis (in exactly the same form as in the table of contents). In this section, the author relates all of the material he or she wishes in reply to the research questions posed, as well as the conclusions based on the material. Repetition should be avoided unless it is necessary for the sake of clarity.

Each citation should be clearly referenced so that the reader may refer to the original source.

The nature of the work determines the form of discussion. The discussion may often be divided into a theoretical part, empirical part and results:

the theoretical background, including the literature and previous research and concepts on which the thesis is based
observations, data collection etc. In order for the observations to have scientific value, the research process should be described in detail.
the discussion on observations and the presentation of the results are often closely connected. All calculations need not be shown, as long as the author explicitly explains how they are done.

Figures, tables, equations etc. make the discussion more concrete and enhance readability. They are captioned and numbered, each as their own group.

On the use of technical and mathematical terms and expressions:

cited expressions and equations must always be referenced unless they can be considered common knowledge You do not need to show how an equation is derived.
the derivation of new expressions and equations must be presented, or at least its main points. The source of parent equations must be mentioned.
equations are numbered.

Conclusions and Summary

The conclusions summarise the discussion: the starting point of the research, theoretical and empirical choices, objectives and results, conclusions and possible ideas for further research. You may also voice criticism. There is no need to repeat what has already been said in the discussion. Instead, a more expansive viewpoint can be adopted, explaining which questions were left unanswered, etc. No new information is introduced in the conclusions, nor are direct references made to the discussion.

References

Listing references and the related ISO 690.2 and SFS 5342/1987 standard are presented in detail by Mälkiä (1994). If you use more than one source by the same author, the older ones are listed first. If more than one of them are from the same year, they are listed in alphabetical order according to the title and a lower-case letter is added after the year (a, b, c…).

The references may not include sources that are not cited. The sources should be described in detail and in the same way.

Sources are usually referenced as follows:

Books Author(s), editor(s)
Publication year
Title
Edition (if more than one)
Place of publication
Publisher (NB: not printing press! Excluding company form abbreviations)

Example of source with one author: Patton, M. Q. 1990. Qualitative evaluation and research methods. London: Sage.

Example of source with two authors: Leino, A. & Leino, J. 1988. Kasvatustieteen perusteet. Jyväskylä: Gummerus.

Sources with many volumes are presented in the same way, and the volume in question is also mentioned.

Journal papers Author(s)
Publication year
Title of paper
Title of journal
Volume (annual set)
Issue
Pages

Example of a source with more than one author: Porter, L. W., Steers, R. M., Mowday, R. T. & Boulian, P. V. 1974. Organizational commitment, job satisfaction, and tumover among psychiatric technicians. Journal of Applied Psychology, vol. 59, n:o 2, pages 603-609.

Publication series Author(s)
Publication year
Title of publication
Body in charge
Place of publication
Publisher
Title and number of series

E.g.: Laiho, L. (ed.) 1984. Arctic technology research projects in Finland. Espoo: Valtion teknillinen tutkimuskeskus (VTT). Tiedotteita 331.

Final theses Author
Year
Title
Type of thesis
(doctoral dissertation, Master's Thesis etc.)
Institution and department

If you reference a compilation, remember to 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

Appendices

Appendices may include equations, diagrams, drawings etc. that do not need to be included in the actual text, but to which you refer. 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 body text.

The heading of an appendix is written at the top of the page. Appendices are numbered. Appendix pages, however, are not numbered; only the final numbered pages of the thesis are part of the table of contents. Appendices and their headings may be listed at the end of the table of contents.

Referencing (citations in the body text)

Citations from books, journals, publication series and theses follow the same guidelines as the list of references. Citations include the following: author(s), year, page(s). Thus referencing can be done as follows: ”Williamsson (1995, 23-25) states” or (Teece et al. 1986). Mälkiä also discusses citations.

If there is more than one author, the first author's name is followed only by "et al.". This is also how you should cite electronic sources, for instance (Denning 1996). Do not include the web site address – it should be indicated in the list of references. If several sources are referenced at once, they should be separated with a semicolon in brackets (;). You should pay attention to where you place the reference. If you want the reference to include the entire preceding paragraph, place it in brackets after the final period. If you only want it to include the preceding sentence, place the period after the second bracket. This should also be done within a paragraph. Direct quotations should be in quotes. If you cite the same source twice in a row, the latter can simply be marked: Ibid.

Footnotes are only used for explanations and additional comments on the body 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 both above and below the line.

The instructions above are merely guidelines, they are not binding. Referencing can be done in another commonly approved way or following the examiners’ instructions. The key to referencing is consistency.

Major subjects may issue their own instructions for authors to follow. Authors must also take into account the requirements set by the language of the thesis.

Further tools in preparing a thesis:
Hirsijärvi - Hurme: Tutkimus ja sen raportointi, 1990.
Hirsijärvi - Remes - Sajavaara: Tutki ja kirjoita, 2002.
Mälkiä, Matti: Teksti- ja kirjallisuusviitteiden laatiminen. Tampere: Tampereen yliopisto, Hallintotiede, 1994 B6.

Lappeenranta, 23 May 2007
Ilkka Pöyhönen
Vice-Rector