SCHOOL OF ENGINEERING

JÖNKÖPING UNIVERSITY
SWEDEN

INTERNATIONAL STUDY BROCHURE AND ECTS GUIDE FOR PARTNER UNIVERSITIES
2012/13

DEAR STUDENT,

It is my pleasure to invite you to join the dynamic environment at the School of Engineering as an international exchange student from one of our partner universities. You will become an important part of our active international programme.
When you arrive in Jönköping, you will discover that we have a stimulating study atmosphere where close contact between students and teachers is one of the key components. In addition to the warm and welcoming environment, the increasing number of students over the years has all appreciated the long list of courses given in English, as well as the guarantee of student accommodation.
The international division of the student union is very active in arranging all sorts of activities aiming to give you an insight into Swedish culture and the Swedish way of life, as well as to make your stay enjoyable.
You will soon discover the many benefits of Jönköping. The charm and safety of a small town on the one hand, combined with the vibrancy and attractions of a city.
It is easy to make new friends, and I am convinced you will leave Jönköping with many unforgettable memories.
I very much look forward to seeing you here in Jönköping!

John Ahlnér
Director of Marketing and International Relations

CONTENTS.

Jönköping University Foundation is one of three independent institutions of higher education in Sweden offering postgraduate programmes. It is characterised by focused profiles, an international dimension in all activities, an entrepreneurial spirit and collaboration with surrounding society. Research and education are carried out at four schools: Jönköping International Business School, School of Education and Communication, School of Engineering and School of Health Sciences.

WELCOME TO THE SCHOOL OF ENGINEERING.

The School of Engineering (JTH) is one of four independent schools at Jönköping University. The other three are Jönköping International Business School (JIBS), School of Education and Communication (HLK) and School of Health Sciences (HHJ). Jönköping University has almost 12,000 students of which 2,500 are registered at the School of Engineering. The total number of employees at the university is 800. About 150 of these work at the School of Engineering.

A MODERN SCHOOL.

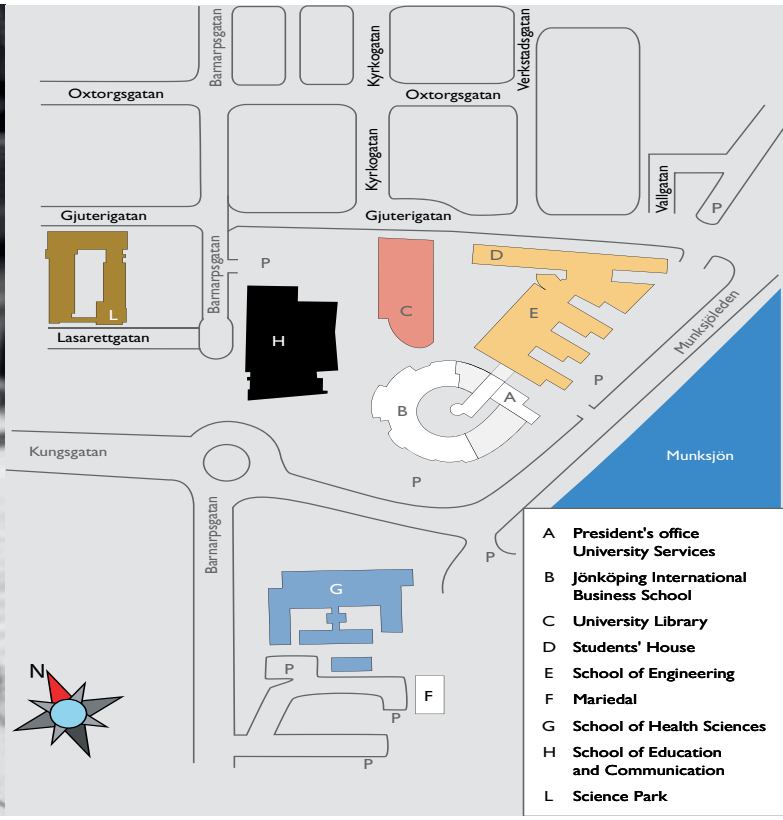
The School of Engineering in Jönköping is one of the most modern in Sweden. Engineering degree programmes are conducted in close collaboration with the business community, and students enjoy a continuous insight into the working and entrepreneurial spirit of small and medium-sized companies. The courses are designed to provide students with a broad technical knowledge base, combined with knowledge of leadership, communication, business and ecology.

EXPANDING RAPIDLY.

More and more students are discovering the benefits of studying in Jönköping, at a new and modern university. Conventional degree courses have given way to an effective method of developing programmes in consultation with the business community.
The School of Engineering is one of the largest in Sweden to grant bachelor engineering degrees. More than one-third of the student body is made up of women, and some 50 % come from other regions in Sweden.

GREATER FREEDOM.

An Act of Parliament established Jönköping University in its present form in 1994. As part of its policy of decentralisation and private enterprise the Conservative Party decided to allow a limited number of higher education institutions to become independent of direct state control and to try a different type of organisation. Jönköping University is one of only three foundation universities in Sweden (the others are Stockholm School of Economics, and Chalmers Technical University in Gothenburg).
As a result Jönköping University answers directly to an appointed Board of Governors instead of to the Ministry of Education (although the Ministry may be given the right to appoint some members of this Board). Foundation status allows the university the luxury of greater freedom, especially in the area of staff recruitment and research.



A MODERN CAMPUS IN THE CITY CENTRE.

The modern university campus is situated by Lake Munksjön right in the middle of the western part of Jönköping close to everything what the town has to offer, including shops, restaurants, cafés, nightlife and entertainment.

RIGHT IN THE CITY CENTRE.

The location of Jönköping University right in the middle of the city with all four schools gathered together is unique. Often universities are located outside the cities and/or the different institutions spread out from each other.
The School of Engineering is located in the western part of Jönköping together with the three other schools which form Jönköping University. Shops, restaurants, cafés as well as nightlife and entertainment can be found within walking distance.

MANY MEETING POINTS.

There are many places on campus where students can meet, including the library, with its many quiet and group study areas, lecture halls, computer rooms, group and common rooms but also restaurants, cafés and the pub.
The university library is fully IT equipped and has access to the most important national and international technical databases. The library is housed in a tastefully renovated foundery workshop from 1914.
International Association on campus is a 'crossroads' for the meeting of students from all over the world, the venue also houses exhibitions on cultures from around the globe.

THE STUDENT UNION.

The Student Union strives to make the time students spend at the university both meaningful and exciting. Student influence, evaluation and quality control are top priorities. Student Union membership is an obligation for students at Jönköping Unviersity.
The Student Union fees are approximately 250 SEK per semester. After paying the fee, students will receive a student card that entitles to use all the facilities and services provided by the university, as well as to discounts in specified shops and other outlets.
A number of committees and groups are associated with the Student Union. The Student Union and the International Association arranges parties, bar evenings, film sessions, sports activities, cultural events and trips etc. The International Association organizes host students and host families for interested international students. The host students are there for the international students to answer questions, for general support and to help to adjust and enjoy the stay in Jönköping.
The engineering students have their own section within the Student Union, Hi Tech. Hi Tech also have committees in different fields such as the international committee Hint, which also organizes activities for the international students.

SOME WORDS ABOUT JÖNKÖPING AND SWEDEN.

The landscape around Jönköping, with its mountains, hundreds of lakes and extensive forest and farmland, is renowned as one of Sweden's most attractive regions. The city was founded in the 13th century, and lies on the southern shores of Lake Vättern, the second largest lake in Sweden. Jönköping is Sweden's tenth largest city, with a population of approximately 125,000. Almost three million people live within a radius of around 170 km.

CORPORATE REGION WITH LEISURE FACILITIES.

Jönköping is home to many Swedish and international companies, and is the hub of their business and networks throughout Scandinavia.
This is the right place for anyone interested in culture, sport and outdoor activities. The city has some 700 active clubs and associations. You will find several modern leisure centres, golf courses, ski slopes, swimming pools, riding schools, cinemas, concert halls and museums, along with restaurants, cafés and shopping centres.

LET YOURSELF BE CAPTIVATED.

It is easy to feel at home in Jönköping. Here you can find the entire range of housing conditions; from the throb of a large city to small picturesque villages, or the solitude of the countryside.
There are also many opportunities for enjoying the fine natural surroundings of Jönköping. Those interested in the countryside and open-air life can choose between bogs and forests, meadows and fields, valleys and highlands. And in Jönköping County there are over 2,000 lakes and more than 300 rivers and streams.

A WIDE COUNTRY.

Sweden is the fourth largest country in Europe with an area similar to California or Spain. Thanks to the Gulf Stream in the Atlantic Ocean Sweden has a milder climate than other areas equally far north. The four seasons divide the year in Sweden into very distinct parts.
The summer temperature encourages sunbathing and sport, and the spectacular spring and autumn help to counterbalance the effect of the winter. The mean temperature may exceed + 20 degrees C in the warmest summer months. The coldest months are January and February, when the temperature mostly is between 5 and -15 degrees. During the summer it never gets really dark, and in the north the sun does not set at all for some time. During the winter months there are about six hours of full daylight in the south while for two months in the far north the sun never rises above the horizon.

MOST OF THE PEOPLE LIVE IN THE SOUTH.

Sweden has a population of 9 million, with about 85 percent living in the southern half of the country. One third of the population lives in one of the three largest cities, Stockholm, Gothenburg and Malmö. Stockholm, the capital, founded in 1252 is the largest of the three with almost 2 million inhabitants.

Sweden has two minority groups of native inhabitants in the north: the Sami (Lapp) population and the Finnish-speaking people of the northeast.

MOST SWEDES ALSO SPEAK ENGLISH.

There is one official language, Swedish. There is also a minority of the population who speaks Sami and Finnish. Most Swedes are able to speak English, and many also speak German or French.
About 90 percent of the population belong to the Church of Sweden, which is Lutheran. However, Sweden has freedom of religion and in the Jönköping area you will also find many other denominations.

GOVERNMENT.

Sweden is divided into 21 counties (*län*) and 290 municipalities (*kommuner*). The country is a multi-party parliamentary monarchy with power shared by the Parliament *(Riksdag)*, the Government *(Regering)* and the Prime Minister *(Statsminister)*. Elections to the Riksdag are held regularly every four years.
The Swedish monarchy rests on traditions going back more than a thousand years in time. The King is the Head of State, but he has not the power to overrule the Government any longer.

THE EDUCATION PROGRAMMES.

The Bachelor of Science degree programmes at the School of Engineering last for three years, and is worth 180 Swedish university credits equivalent to180 ECTS credits. Students can choose between Civil engineering, Computer engineering, Industrial engineering and Management or Mechanical engineering majors.

ABOUT 70 COURSES IN ENGLISH.
The School of Engineering offers about 70 courses entirely in English, which are all open to international exchange students from our partner universities.
International exchange students may choose courses taught in the English language within all of the Bachelor degree programmes, and within all the Master programmes as long as they possess the necessary prerequisites. Students are also welcome to do their final project work in Jönköping.

CO-OPERATION WITH THE OTHER SCHOOLS.
Furthermore, in co-operation with the School of Education and Communication and the School of Health Sciences, it is possible to add courses selected from a wide range of areas.
Regarding international activities, the School of Engineering takes part in the scheme of the European structural programmes Erasmus, Nordplus, Linneaus-Palme and Tempus, and there are also a number of Bilateral Agreements, which include student mobility.

BACHELOR OF SCIENCE PROGRAMMES - 180 ECTS

CIVIL ENGINEERING
Building Projects / Civil Engineering Projects
Building Projects with Architectural Technology
COMPUTER ENGINEERING
Web Development / Programming and Computer Networks
Embedded Systems
INDUSTRIAL ENGINEERING AND MANAGEMENT
Logistics and Management
MECHANICAL ENGINEERING
Product Development and Industrial Design
Industrial and Production Management

MASTER OF SCIENCE PROGRAMMES (two years) - 120 ECTS

INFORMATICS
Information Engineering and Management
PRODUCT DEVELOPMENT
Product Development and Materials Engineering
Industrial Design
PRODUCTION SYSTEMS
Production Development and Management

UNIVERSITY DIPLOMA/ BACHELOR DEGREE - 120/180 ECTS

Computer Networking Technology*
Graphical Design and Web Development
Lighting Design*

* Programmes instructed completely in Swedish and are not presented in the catalogue.

STUDYING AT THE SCHOOL OF ENGINEERING.

Education at the School of Engineering is based on the principle that students take responsibility for their studies, with support from the teaching faculty. The teaching takes different forms: lectures, seminars, group work, laboratory work, independent study, etc.

THE CREDIT SYSTEM.

A national credit system is used by Swedish universities to show the scope of a course or study program. One week's full-time study (40 hours) corresponds to 1.5 *higher education credit (hp)*. Each semester is 20 weeks long, during which a student is expected to take 30 credits' worth of courses. 1 Swedish credit is equal to 1 ECTS credit.

DEGREES AND DIPLOMAS.

The degrees are structured according to the Bologna declaration. Bachelor's degrees are awarded for studies totalling at least 180 ECTS credits – three years full-time study – of which at least 90 credits must be in the major subject. Professional diplomas are also awarded for programs leading to a specific profession.

Master of Science's degrees are awarded for studies totalling at least 240-300 ECTS credits – four to five years full-time study – of which at least 120 credits must be in the major subject.

A Doctoral degree comprises 240 ECTS credits and is normally expected to include three years full-time study, in which the student is engaged both in a research assignment and in theoretical studies in the form of seminars and courses. The research assignment should result in a scientific thesis. A Licentiate degree may be obtained after two years' researcher training.

COURSES IN ENGLISH.

To meet the needs of exchange students, the School of Engineering offers a large number of courses in which English is the sole language of tuition. The exchange students study together with Swedish students in their regular courses in the study programmes.

TEACHING METHODS.

Courses are normally based on lectures and laboratory work with a final examination on the scheduled examination week after each segment. Attendance at the laboratory work is compulsory. In addition, there are seminars and various forms of group work with written and oral assignments.

A large proportion of the teaching is project oriented. Groups of 4–5 students conduct an accredited work task within stipulated guidelines as regards time, budget and work effort.

To manage the studies it also requires a lot of work of your own at your spare time. The students take their own responsibility for the studies.

At the end of all engineering programmes, students must carry out a final project work, either individually or with a study partner. If students make a Final Project Work they will have a tutor (teacher) who guides them, but they need to take the responsibility and initiative in proceeding with the project.

COURSE LITERATURE.

Students are expected to buy their own books.

The library also has all the course books. It is not allowed to borrow this reference literature, but it is possible to take photocopies for your own use to a certain extent or read it in place.

EXAMINATIONS.

Different forms of examination are used. A common method is the written or oral examination, which includes the presentation of a paper. Group papers are normally discussed during seminars towards the end of a course. A written examination takes place at the very end of each course.

Traditionally, four grades are awarded at technical universities: pass (3) with distinction (4, 5) and fail (U). If students fail an examination there are possibilities to re-sit it at a separate re-sit week. Registration for all examinations is required.

Examination results are announced within 15 working days after the examination date and will be e-mailed to the students. Students are able to get the examination paper back from the teacher. Re-examination is offered to all students and must be done at School of Engineering.

EXAMINATION REGULATIONS.

The examinations are strictly regulated regarding the time, identification documents, permitted aids, outdoor clothes and other personal belongings, electronic equipment, behaviour and orderly conduct. Detailed regulations are found on the website and included in the folder, which is handed out at the welcome meeting.

ACADEMIC INTEGRITY.

Students are expected to adhere to the highest ethical standards in their course work and research. Individuals violating the university's code of conduct will be subject to disciplinary action. Breaches can lead to expulsion from the university or to withdrawal of a degree already granted. Violations include cheating and fraud. All students should be familiar with the university's code of conduct.

The Disciplinary Committee decides on disciplinary measures which may take the form of warnings, suspensions or expulsion.

THE EUROPEAN CREDIT TRANSFER SYSTEM (ECTS).

ECTS, the European Community Course Credit Transfer System, was developed by the Commission of the European Communities in order to provide common procedures to guarantee academic recognition of studies abroad. It provides a way of measuring and comparing learning achievements, and transferring them from one institution to another.

WHAT IS ECTS?

The ECTS system is based on the principle of mutual trust and confidence between the participating higher education institutions. The few rules of ECTS, concerning Information (on courses available), Agreement (between the home and host institution) and the use of Credits (to indicate student workload) are set out to reinforce this mutual trust and confidence.

THE ECTS CREDITS.

ECTS credits are a value allocated to course units to describe the student workload required to complete them. They reflect the quantity of work each course requires in relation to the total quantity of work required to complete a full year of academic study at the institution, that is, lectures, practical work, seminars, self-studies - in the library or at home - and examinations or other assessment activities. ECTS credits express a relative value.
In ECTS, 60 credits represent the workload of a year of study; normally 30 credits are given for a semester. It is important that no special courses are set up for ECTS purposes, but that all ECTS courses are mainstream course of the participating institutions, as followed by home students under normal regulations.
It is up to the participating institutions to subdivide the credits for the different courses. ECTS should be allocated to all the courses units available - compulsory or elective courses. Practical placements and optional courses, which form an integral part of the course of study, also receive academic credit. Credits are awarded only when the course has been completed and all required examinations have been successfully taken.
At Swedish universities credits are given for each course in terms of Swedish *higher education credits*. One week's full-time study is equivalent to 1.5 credits and one academic year's full-time study to 60 credits. Thus 1 Swedish credit is equivalent to 1 ECTS credit.
All exchange students receive ECTS credits on completed courses. On some courses the grades pass or fail are used for a part of the course such as laboratory work.

ECTS GRADE	PERCENTAGE OF SUCCESSFUL STUDENTS NORMALLY ACHIEVING THE REQUIRED GRADE	DEFINITION
A	10	EXCELLENT
B	25	VERY GOOD
C	30	GOOD
D	25	SATISFACTORY
E	10	SUFFICIENT
FX	-	FAIL (More work required before the credit can be awarded)
F	-	FAIL (A considerable degree of extra work is required)



THE ACADEMIC YEAR.

The academic year at the School of Engineering for 2012/2013 consists of the Autumn Semester, that runs from August 20, 2012 til January 13, 2013 and the Spring Semester, that runs from January 14, 2013 til June 2, 2012. There is usually a break of two or three weeks at Christmas, when there is no formal tuition.

Each of the two semesters is then divided into two segments. A full-time study workload is 30 credits per semester, equal to 30 ECTS credits. This means that an academic year of study could give the student a maximum of 60 credits.
Exchange students are recommended to study two segments in Jönköping, preferably the complete autumn semester or the complete spring semester, and to include into their study programme the introductory course "Swedish Language, Culture and Society". International exchange students, although following a Bachelor degree programme, have the freedom to take any courses listed for any programme, as long as they possess the necessary prerequisites.

ACADEMIC CALENDAR AND PUBLIC HOLIDAYS.

DATE	ACTIVITY
August 17-19	Arrival and Pick-up Service available
August 20 - 26	Introduction Week for International Students
August 20 - October 12	Segment 1, Classes
October 13 - 21	Examination Period (segment 1)
October 22 - December 11	Segment 2, Classes
December 12 - 19	Examination Period (segment 2)
January 6 - 13, 2013	Re-examination Period (Segment 1+4)
January 4 - 6, 2013	Arrival And Pick-up Service Available
January 7 - 11	Introduction Week for International Students
January 14 - March 15	Segment 3, Classes
February 9 - 17	Re-examination Period (Segment 2)
March 16 - 24	Examination Period (segment 3)
March 25 - May 21	Segment 4, Classes
May 22 - 29	Examination Period (segment 4)
May 30 - June 05	Re-examination Period (Segment 3)

DATE	PUBLIC HOLIDAYS 2012/2013
November 3	All Saints' Day (Alla Helgons Dag)
December 25	Christmas Day (Juldagen)
December 26	Boxing Day (Annandag Jul)
January 1	New Year's Day (Nyårsdagen)
January 6	Epiphany (Trettondedag Jul)
March 29	Good Friday (Långfredagen)
March 31	Easter Sunday (Påskdagen)
April 1	Easter Monday (Annandag Påsk)
May 1	May Day (Första Maj)
May 9	Ascension Day (Kristi Himmelfärdsdag)
May 19	Whit Sunday (Pingstdagen)
June 6	Swedish National Day (Nationaldagen)
June 22	Midsummer Day (Midsommardagen)

ADMISSION PROCEDURE.

Once a year the International Office at the School of Engineering sends the ECTS information package, information about the application, housing and other relevant information to the partner universities. Students are asked to contact the International Office or department co-ordinator for information. An online application form is used for admission.

ONLINE APPLICATION AND DEADLINE.

Students need to log in to the online application. The coordinators at the partner universities inform the International Office at the School of Engineering which students are selected to apply. The applicants then receive individual passwords. The students print the Confirmation of Course Choices, have it signed by the coordinator and send it including enclosures (English translation of certificates etc.) to the International Office at the School of Engineering before May 1 for entry in August (the Autumn semester) and October15 for entry in January (the Spring semester). The deadline to be admitted to a complete Master programme is January 15. More information can be found on our website.

Students interested in doing a final project work must submit their applications at least two weeks before deadline. We still cannot guarantee to find a supervisor and a project but we put all our efforts in doing so.

Please make sure all necessary documents are enclosed. Contact the International Office for more detailed information.The admission notification will be returned by the middle of December (for the Spring semester) and by the middle of June (for the Autumn semester) together with some practical information.

CHOICE OF COURSES.

Students fill in the choice of courses in the online application. Select courses in total 30 credits per semester and choose four alternative courses in the event of course cancellations or clashes.

Please consider the time periods (segments) when the courses are given, select two or three courses for each segment and two alternatives. Information about when different courses are running can be found on page 16-17 and in the online application.

The home institution certifies that the student fulfill the prerequisites for each chosen course by signing the Confirmation of Course Choices.

The students will be registered on the courses applied for and agreed on. Changes upon arrival are only possible in exceptional cases.

LANGUAGE REQUIREMENTS.

To meet the needs of exchange students the School of Engineering offers a number of courses in which English is the sole language of tuition. Students admitted to courses in English do not require any knowledge of Swedish, though a good command of English is essential. Although the TOEFL score is not a formal requirement, all students must have the equivalence of a TOEFL score of at least 550 (old scale) and 213 (new scale). When signing the Confirmation of Course Choices the sending institution guarantees the student's language proficiency.

To give the exchange students as good start as possible, an intensive Swedish language course for beginners is offered as a regular course during the first part of each semester. This course is, like all others, free of charge.

INTRODUCTION WEEK.

In the beginning of each semester there are mandatory introduction days for new international students. A welcome letter from the International Office is sent to all new international students and includes information about the exact dates of the introduction activities. These normally cover most of the first week of each new semester.

INTERNATIONAL DAY.

Each semester all exchange students take part in International Day. It's a day for presentations of the partner universities organized as a small fair in the entrance hall. It gives a good opportunity for students and staff to learn more about the universities, countries and cultures.

TRANSCRIPT OF RECORDS.

All students get a transcript of records for the courses taken at School of Engineering. Unfortunately students cannot get this before departure, because all credits have not been registred at that time.

STARS.

All exchange students are asked to register their evaluation of the studies at School of Engineering in STARS, Study Abroad Report System, before they return home. These anonymous reports are available on our website for students who would like to know more about students exchange study experience in Jönköping.

ECONOMY AND BEFORE DEPARTURE.

International students must prove when applying for a residence permit that they have enough money to cover the stay in Sweden. The minimum sum required at present by the Swedish Migration Board is SEK 7,300 per month (approx EUR 800 or USD 1100 February 2011). Students from the EU and the Scandinavian countries do not have to prove that they have SEK 7,300 a month at their disposal, but have to sign a document stating that they can support themselves in Sweden.

MONTHLY EXPENSES.

This budget slightly exceeds the *minimum* required by the Swedish Migration Board.

- Accommodation 2,000-3,500 SEK
- Food 2,500 SEK
- Books and fees 400 SEK
- Telephone, papers 300 SEK
- Local travel 450 SEK
- Clothing 300 SEK
- Hobbies, leisure (minimum)800 SEK
- Laundry, hygiene and miscellaneous 700 SEK

MONEY AND CREDIT CARDS.

Be sure to have Swedish Kronor (SEK) on hand when arriving in Sweden, to be able to pay for domestic travel expenses, food etc. Do not bring personal cheques. These will not be cashed by Swedish banks. Travellers Cheques, Visa and Master Card are recommended. A valid passport and a Letter of Admission are required to open an account at any of the banks in Jönköping.
All major credit cards are accepted in Sweden when supported by a passport or other proof of identity. It is also possible to use cards at selected cash dispensers.

BEFORE DEPARTURE.

There are many things to consider before travelling abroad. Please see the website of the Swedish Migration Board (www.migrationsverket.se) for latest information regarding residence permits, work permits etc.

RESIDENTS OF THE EU.

Citizens of the European Union do not need to apply for a residence permit before entering Sweden. However, if students intend to stay more than three months they need a residence permit, which is obtainable from the Swedish Migration Board (*Migrationsverket*). Students should register at the Swedish Migration Board before the initial three months have expired. Required documents: a valid passport, a Letter of Admission, valid health insurance policy from your home country i.e. the EU-card or the document E101. Document stating that the student can meet their own living expenses throughout their stay (7,300 SEK/month)Application forms should be sent to the Swedish Migration Board.

RESIDENCE PERMIT FOR NON-EU RESIDENTS.

Citizens from of other countries than an European Union-country need a residence permit, which must be stamped into the passport before entering Sweden. For further information regarding application procedures, contact the nearest Swedish Embassy or Consulate. It takes at least two months to obtain a residence permit. Documents needed: valid passport, a Letter of Admission, health insurance policy valid in Sweden, documents (bank guarantee etc.) stating that the applicant can meet their own living expenses throughout the stay in Sweden (7,300 SEK/month). The application can also be done online at the Swedish Migration Board´s website www.migrationsverket.se.

VACCINATIONS.

There are no special vaccination requirements when entering Sweden. It is, however, recommended to be inoculated against tetanus, polio and diphtheria.

INSURANCE.

It is very important to have valid insurance from the home country that covers illness and accidents. Students need to have a valid insurance before arriving in Sweden. Jönköping University do provide an insurance for exchange students that covers injuries but only during school hours and during travel to and from the location where school hours are spent. It does not cover injuries during leisure time or medical treatment costs during illness.
Guest students won't be able to obtain insurance in Sweden. There are reciprocal agreements between Sweden and many countries concerning medical care and hospital treatment (emergency treatment). Check with the Social Insurance Office on what kind of agreement exists between Sweden and other countries. Citizens from EU countries can obtain medical insurance, either the EU-card or E101, through the National Public Health Insurance office in their home country. Dental care is not included in this insurance. We highly recommend to purchase insurance for personal property, lost of goods or emergency transport home. The university will not cover any costs incurred for medical treatment, dental care, loss of property etc.
Students who are staying in Sweden for more than one year, are entitled to benefits from the Swedish National Public Health Insurance System that gives medical care on the same conditions as Swedish citizens, i.e. students then pay a reduced fee when receiving medical care and buying medicine. To be entitled to medical benefits, students need a civic registration number which will be received after registration at the Local Tax Authority (only for students staying more than one year). This should be done as soon as possible after arrival and registration at the university.

TRAVELLING TO JÖNKÖPING.

It is easy to travel to Jönköping, by car, plane, train, bus or boat. The city is about 320 km from Stockholm, 300 km from Malmö and 150 km from Gothenburg. Or to be a bit more international; 500 km from Hamburg, 330 km from Copenhagen, 1,100 km from London, 1,300 from Moscow, 11,000 from New York and 15,000 from Tokyo.

BY CAR.

The E4 highway runs through Jönköping from Helsingborg in the south to Haparanda in the north of Sweden. When you arrive at the outskirts of Jönköping you follow the signs to *Centrum* and *Högskola*.
There are some parking places outside the university area where you can park the car for a small amount.

BY PLANE.

Students are recommended to fly either to Stockholm Airport Arlanda, Gothenburg Airport Landvetter or to Copenhagen Airport Kastrup, Denmark which are the nearest international airports.
Jönköping also has an airport, Axamo, with connections with some airports, for example Stockholm and Copenhagen. Axamo is situated about 10 kilometres west of the city.

BY TRAIN.

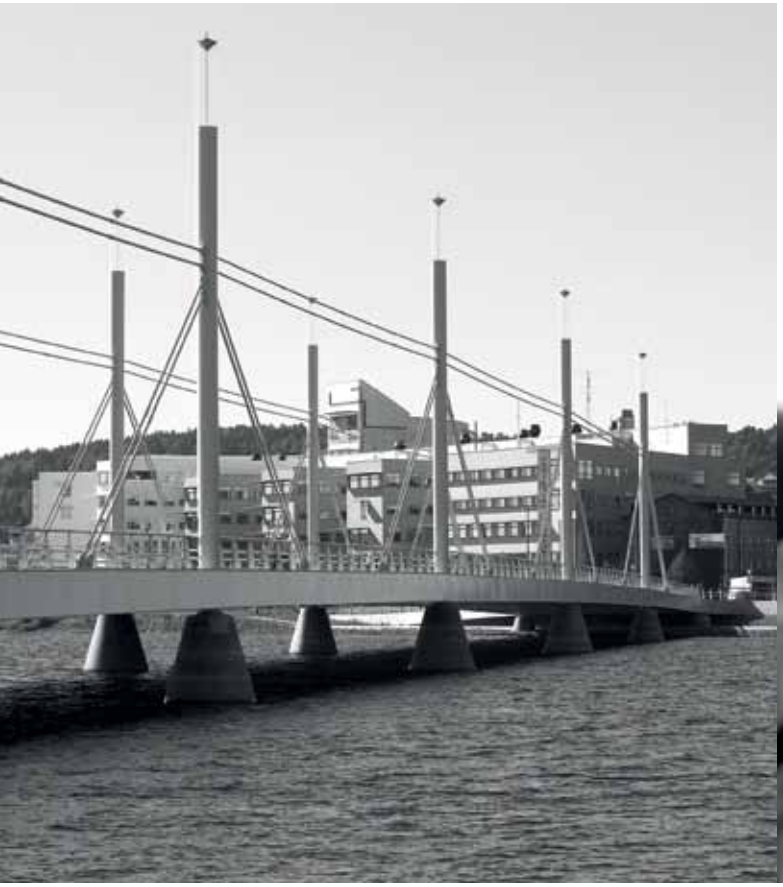
Jönköping has an excellent train service linking it to the major cities such as Stockholm, Gothenburg, Malmö and Copenhagen. However a change may be required in Falköping or Nässjö.

BY BUS.

There are many services from all parts of Sweden which are reliable and cheap. It takes approximately 4 hours from Stockholm, 3 hours from Malmö, and 2 hours from Gothenburg to reach Jönköping.

BY BOAT.

There are many ferry links across to Sweden from various countries including Denmark. There are also frequent service to Gothenburg from Germany, England and northern Denmark.
Jönköping is situated on the southern shores of Lake Vättern, Sweden's second largest lake. However, it is not possible to go by boat directly to Jönköping.



ARRIVAL IN JÖNKÖPING: PICK-UP SERVICE AND ACCOMMODATION.

All international exchange students are guaranteed accommodation and pick-up service, provided that the application for accommodation is made correctly and the arrival is announced before deadline.

ARRIVAL.

Students must announce their arrival online before the deadline in order to get the pick-up service and accommodation.

PICK-UP DAYS.

The university organizes pick-up service during specific days in the beginning of each semester for students who have applied for the pick-up service on time. Students will be picked up at certain check points and taken to the university for information about their accommodation and later on taken to the apartment/room.
Students arriving other days than the pick-up days must arrange transport by their own and get the key to their accommodation at the Accommodation Office at the university (office hours weekdays 2 pm - 4 pm). The students still need to announce their arrival to the accommodation office online.

ACCOMMODATION.

All international students are provided with an accommodation if applied for it and arrival notification is made on time. The alternatives offered to international students are located within 25 minutes by public transport from the university. Rent is paid monthly in advance and is between 2.200 and 3.700 SEK depending on the standard.
If you have applied for housing you have to pay rent from the first month of the semester (January or August). If you arrive late for some reason, rent still has to be paid.
Should you not be satisfied with the accommodation offered, you are personally responsible for making alternative arrangements with two or three months notice to the land-lord.
For detailed information regarding accommodation, arrival and pick-up service (applications, deadlines and instructions), see www.hj.se/en/education/studying-at-jonkoping-university

BEFORE THE STUDIES START.

During the introduction week students will get information on how to get started at the university and in their studies. Practical matters as a computer account, e-mail account, an access card will be solved.

WELCOME MEETING AND REGISTRATION.

A welcome meeting is taking place during the first day, where important information will be given. Students also register at the International Office, where they also will get more information about the courses they have applied for. The students are registered for the courses applied for and agreed on. Changes upon arrival are only possible in exceptional cases.

INTRODUCTION WEEK.

During the first week of each semester there are several information sessions and workshops, as well as activities for international students arranged by the Student Union such as a welcome dinner. Students will receive more information about these activities upon arrival.

STUDENTS´ UNION FEE.

The fee for the Students' Union is mandatory for all students. The membership entitles students to get discounts in several shops and restaurants in town, on domestic travel and to participate in the different activities which the Student Union organizes. It also supports the work the Student Union does for the students, such as educational quality issues and a stimulating social life. The fee is approximately 250 SEK per semester.

COMPUTER ACCOUNT.

During the first days at School of Engineering students will get a computer account and an e-mail account that will allow them to use the computer facilities. Students don't need to apply for it, but must sign an agreement concerning the usage of the computer system.
Students receive 100 copies to print out, when they need to refill it costs 50 SEK for 100 new pages.

ACCESS CARD.

After registration at the International Office students can visit caretakers office at the univerity to get an access card. The card is needed to get in to the computer rooms and into the building in the evenings and during weekends.

STUDENT VOICES:
STUDENT EXCHANGE IN JÖNKÖPING.

Austria, Australia, Bulgaria, France, Germany, Hong Kong, Singapore, South Korea, Spain, USA. Many international students come to Jönköping each year, some looking for somewhat of a different experience.

Hannes Langer, Austria

Jönköping is a small but great city to study in. There is a lot of going on for students here, the student union arranges a lot of trips and one can get around easily with busses and train to other major cities. I love the lake view in Jönköping and the nature around it. There are many trails for hiking and biking through the forests around Jönköping. Furthermore a lot of nice places to visit nearby. The Swedes know how to make the best of every season. The dark winter is embraced with lights in every window and during the brighter months people are outdoors, enjoying every ray of sun. Being a student in Sweden is good fun and needs not to be so expensive as one might fear. There are a lot of offers and deals available in Jönköping and life is not much more expensive than at home.

Martin Tapankov, Bulgaria

My first visit to Sweden was as an Erasmus student. As I got acquainted with the university, its research profile, my supervisors, the staff, and a few of the students, I thought that HJ is a good place to continue my education into the Masters degree.
The courses that I followed were of high quality. I appreciate the more "hands-on" approach that was taken, and that helped me and my colleagues to gain and improve the skills that are relevant to finding a good occupation in the future. The studies also rely heavily on cooperation between the students, and that certainly improved my social and team-working skills. Most of my classmates have now a serious job, and that can be a good indicator of the education quality. After I graduated from the Master program I applied for a PhD position, got approved and now I'm a proud member of the research team at JTH.
I've had a great time as a student here – my classmates were of different cultures and origin, and interacting with them on a daily basis working on a common project was a rewarding experience. The Swedish students in my class were very friendly and open, and I still maintain contact with most of them.

Rowland Marshall, Australia

As this was my first trip outside of Australia, I did not know what to expect. It was my first real experience with a different culture - one that had its own language, customs, and ideals. As with any new adventure, I was a mixture of apprehension and excitement. However all these fears were laid to rest when I stepped off the bus in downtown Jönköping and was met by a smiling face and a warm handshake. The engineering school here has a strong principle of personal contact when dealing with the International Students, with each one of us being met and escorted to our accommodation by a contact person, who would remain in touch with us throughout the early weeks of our stay. The Swedish people, although at times a little harder to approach than what I am used to in Australia, are well deserving of their reputation as warm and friendly folk. Culturally there are several differences between them and the average Australian, which are best left to be explored, but I find it a wonderful change from what I expect back home. Some are quite funny, others eyebrow raising, but all of them well worth trying to understand!

COURSES IN ENGLISH - ACADEMIC YEAR 2012/2013.

The courses may be subject to changes. The segments specified are preliminary. The credits used are Swedish credits which are equal to the ECTS credits. For the most updated information, see our website. Please review your course choices extra carefully with the International Office when applying. The levels of the courses are indicated according to the Bologna declaration. There are two main levels, Bachelor (G) and Master (A), indicating in which program the course runs. The Bachelor programmes are three years of study and the Master programmes are two years of study. For updated courses, please see course description on **http://hj.se/jth/en/education/courses**

BACHELOR OF SCIENCE COURSES	CREDITS	CODE	LEVEL	SEGMENT	INFORMATION PAGES
CIVIL ENGINEERING					
Architecture and Technology	7.5 C	TATC17	G	1	18 and 27
Building Design	7.5 C	TBUB17	G	3	18 and 27
Digital Tools 1	3.75 C	TD1G12	G	4	18 and 27
Digital Tools 2	3.75 C	TD2K11	G	1	18 and 28
Detail Design	7.5 C	TBPC17	G	2	18 and 28
Project Work Architecture and Technology	7.5 C	TATN11	G	2 and 4	18 and 29
Project Work Design and Architecture	7.5 C	T1AN11	G	2 and 4	18 and 29
Project Work Design and Architecture	15 C	T2AN11	G	1-2, and 3-4	18 and 29
Project Work Structural Engineering	7.5C	TP1N11	G	2 and 4	18 and 30
Project Work Structural Engineering	15 C	TP2N11	G	1-2 and 3-4	18 and 30
COMPUTER ENGINEERING					
Computer Graphic Media Technology	7.5 C	TDGC17	G	1	19 and 30
Relational Databases	7.5 C	to be set	G	2-3	19 and 31
Information Security	7.5 C	TIAA17	G	2	19 and 31
Mobile Applications	7.5 C	TMOB18	G	2	19, 22 and 31
Applications for Mobile Devices	7.5 C	TMOK12	G	3	19, 22 and 31
Introduction to Programming	7.5 C	to be set	G	1-2	19 and 31
Systems Analysis and Design with a concept of quality	7.5 C	TIAC17	G	1	19 and 32
ELECTRICAL ENGINEERING					
Digital Electronics Design	7.5 C	TDDB18	G	3	19 and 32
Real Time Operating Systems	7.5 C	TROK10	G	2	19 and 32
INDUSTRIAL ENGINEERING AND MANAGEMENT					
Purchasing and Supply Chain Management	7.5 C	TIAC18	G	1	20, 21 and 32
Work - Human - Technology	7.5 C	TAMB17	G	1	20, 21 and 33
MECHANICAL ENGINEERING					
Applied Finite Element Analysis	7.5 C	TFDS11	G	4	25 and 43
CAD - Basic Solid Modelling	7.5 C	TCSA17	G	3-4	21 and 33
Mechatronics M	7.5 C	TMMB19	G	4	21 and 33
Material Testing and Characterization	7.5 C	TMPK11	G	2	21 and 34
Component Casting	7.5 C	TKGK12	G	1	21 and 34
Material and Failure Analysis	7.5 C	TMHK12	G	4	21 and 34
Simulation of Rigid Body Systems	7.5 C	TSSC18	G	4	21 and 34
GENERAL COURSES IN ENGLISH					
Intercultural and International Communication	7.5 C	TIKA17	G	2 and 3	35
Matematical Statistics	7.5 C	TMSB17	G	3	35
Physics and Simulations	7.5 C	TFSK12	G	4	35
Research and Inquiry Methodology	7.5 C	TFUD27	A	1	35
Swedish Language, Culture and Society 1	7.5 C	LS1F11	G	1 and 3	36
Swedish Language, Culture and Society 2	7.5 C	LS2F11	G	2 and 4	36
Technical English	7.5 C	TENA17	G	3	36
Final Project Work, Bachelor*	15 C	to be set	G	1-2 and 3-4	37

The Bachelor courses are classified as G level and Master Programmes courses as A level. For detailed information about prerequisites, please look at the information pages.

MASTER OF SCIENCE COURSES	CREDITS	CODE	LEVEL	SEGMENT	INFORMATION PAGES
INFORMATION ENGINEERING AND MANAGEMENT					
Business Intelligence	7.5 C	JBBC18	G	1	23 and 37
Database Systems and Trends	7 C	TDTD28	A	2	23 and 37
Development of Distributed Applications	7 C	TUDD27	A	1	23 and 38
Developing Electronic Commerce Capabilities	7.5 C	JDEC17	G	1	23 and 38
Enterpreneurial Performance Managenemt	7.5 C	JEIR21	A	4	23 and 39
Enterprise Modelling	7.5 C	TVMD28	A	3	23 and 39
Enterprise Systems	7.5 C	JERC18	G	1	23 and 39
Information Logistics	7.5 C	TILD28	A	2	23 and 40
Information Retrieval	7.5 C	TIRD28	A	3	23 and 40
Knowledge Modelling and Knowledge Management	7 C	TKKD28	A	2	23 and 40
Software Engineering Methods	7.5 C	TMMD28	A	4	23 and 40
Software Quality and Project Management	7.5 C	TMPD28	A	1	23 and 41
PRODUCTION DEVELOPMENT AND MANAGEMENT					
Competitive Production	7.5 C	TKPD27	A	1	24 and 41
Operation Strategy	7.5 C	TPSR21	A	1	24 and 41
Integrated Product and Production Development	7.5 C	TPPS22	A	3	24 and 42
Leadership	6 C	TLER21	A	2	24 and 42
Production Systems Development	7.5 C	TPUS21	A	2	24 and 42
Supply Chain Management	7.5 C	TLOS21	A	4	24 and 43
PRODUCT DEVELOPMENT AND MATERIALS ENGINEERING					
Applied Finite Element Analysis	7.5 C	TFDS11	G	4	25 and 43
Advanced Casting Materials Processing	7.5 C	TGMS21	A	4	25 and 43
Computer Programming for Design Automation	7.5 C	TPAR20	A	2	25 and 43
Computer Supported Engineering Design	7.5 C	TDKS21	A	1	25 and 44
Conceptual Engineering Design	7.5 C	TKKC18	G	1	25 and 44
Integrated Product Development	7.5 C	TIPD27	A	3	25 and 44
Introduction to Industrial Design	6 C	TIDN10	G	1	25 and 45
Materials and Manufacturing Processes	7.5 C	TMTD28	A	3	25 and 45
Materials and Design	7.5 C	TMDR20	A	2	25 and 45
Modelling and Simulation of Casting	7.5 C	TMSS20	A	2	25 and 45
Non-linear Finite Element Analysis	7.5 C	TOLS21	A	1	25 and 46
Optimization Driven Design	7.5 C	TODS21	A	2	25 and 46
Simulation of Rigid Body Systems	7.5 C	TSSC18	G	4	21 and 34
INDUSTRIAL DESIGN, SEMESTER 1**					
Design communication 1	7,5 C	TDIN10	G	1-2	26 and 47
Design philosophy and practice	7.5 C	TDPR20	A	1	26 and 47
Introduction to Industrial Design	6 C	TIDN10	G	1	26 and 45
Materials and Design	7.5 C	TMDR20	A	2	26 and 45
Multicultural Competence	1.5 C	TMÅA17	G	2	26 and 47
INDUSTRIAL DESIGN, SEMESTER 2**					
Business and economics	6 C	TFEK11	G	3-4	26 and 48
Design and Communication 2	9 C	TD2S21	A	3-4	26 and 48
Ergonomics	7.5 C	TPER21	A	4	26 and 48
Man light and space	7.5 C	TMÄD27	A	3	26 and 49
Mathematical Statistics	7.5 C	TMSB17	G	4	26 and 35
INDUSTRIAL DESIGN, SEMESTER 3**					
Design communication 3	10.5 C	TD3S20	A	2	26 and 49
Design research methodology	4.5 C	TDFR21	A	1	26 and 49
Industrial design project	15 C	TIDR21	A	1-2	26 and 49
GENERAL COURSES IN ENGLISH					
Final Project Work, Master*	30 C	to be set	A	1-2 and 3-4	46

* Students interested in doing a Final Project Work must submit their application including a project proposal two weeks before the deadline of course applications. Students will be asked to submit a paper before notification of admission can be given. School of Engineering cannot guarantee to find a supervisor and/or a project.

**Students interested in taking courses within Industrial Design can only do this if a complete semester is chosen. The students must be admitted to a program in Industrial Design within Mechanical Engineering at the home university. Applicants must attach their portfolio to the exchange application and also do an application assignment, see on the website http://hj.se/jth/en/education/master-of-science/industrial-design.html. Limited number of places.

180 ECTS BUILDING PROJECTS/ CIVIL ENGINEERING PROJECTS

This is a broad degree programme in which students can choose between two specialisations; *Building Projects*, where you study the entire building process: from construction technology, project planning and production, to property maintenance and administration or *Civil Engineers Projects,* where you study how to build roads, bridges, railways, and airports, but you will also get knowledge in environmental care, recycling plants and water conversations.

YEAR 1	ECTS
CIVIL ENGINEERING	7.5
BUILDING PHYSICS MATERIALS	7.5
BUILDING PROCESS 1	3.75
DIGITAL TOOLS 1	3.75*
ENGINEERING METHODS 1	3.75
LINEAR ALGEBRA	7.5
CALCULUS	7.5
ORGANISATION, LEADERSHIP AND CHANGE	7.5
URBAN PLANNING	7.5
ENGINEERING TOOLS	3.75

YEAR 2	ECTS
STRUCTURAL ENGINEERING 1	7.5
DIGITAL TOOLS 2	3.75*
BUILDING TECHNOLOGY 1	7.5
INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP	7.5
GEOTECHNICAL ENGINEERING	7.5
ENGINEERING METHODS 2	3.75
SURVEYING	7.5
CONSTRUCTION MANAGEMENT	7.5
STRUCTURAL MECHANICS AND STRENGHT OF MATERIALS	7.5

YEAR 3	ECTS
/building projects/	
BUILDING DESIGN	7.5*
BUILDING TECHNOLOGY 2	3.75
FINAL PROJECT WORK	15*
BUILDING SERVICE 1	3.75
STEEL AND TIMBER STRUCTURES	7.5
SUSTAINABLE DESIGN	3.75
STRUCTURAL ENGINEERING 2	7.5
/civil engineering projects/	
FINAL PROJECT WORK	15*
WATER ENGINEERING	7.5
HIGHWAY ENGINEERING	7.5
CONTAMINATED LAND	7.5
FOUNDATION ENGINEERING	7.5
CONSTRUCTION MANAGEMENT	3.75
SUSTAINABLE DESIGN	7.5

YEAR 3, ELECTIVE COURSES	ECTS
ACCOUNTING	7.5
ARCHITECHTURE AND TECHNOLOGY	7.5*
CIVIL ENGINEERING STRUCTURES	7.5
CONSTRUCTION MANAGEMENT LAW	7.5
COST ACCOUNTING	7.5
DETAIL DESIGN	7.5*
PROPERTY MANAGEMENT	7.5
CONCRETE STUCTURES	7.5
MAINTENANCE OF TECHNICAL INFRASTRUCTURE	7.5
BUILDING SERVICE 2	3.75
PRESENTATION AND VISUALISATION TECHNICS WITH COMPUTER AID	7.5
TECHNICAL ENGLISH	7.5*
ROAD, WATER AND SEWERAGE DESIGN	7.5
PROJECT: STRUCTURAL ENGINEERING OR DESIGN AND ARCHITECTURE	7.5*
QUALITY AND ENVIRONMENTAL MANAGEMENT SYSTEMS	7.5

GENERAL COURSES IN ENGLISH	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH
All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

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180 ECTS BUILDING PROJECTS WITH ARCHITECTURAL TECHNOLOGY

For us to feel good, it is important that the buildings we live and work in are well constructed. There must be an interaction between technology, the environment, economics and design. This programme provides broad knowledge of construction and techniques, as well as how to construct and plan buildings. Deeper insight is given into architecture, design, architectural history, presentation and visualization. On graduating, there are a variety of potential creative career fields.

YEAR 1	ECTS
HISTORY OF ARCHITECTURE 1	3.75
BUILDING PHYSICS MATERIALS	7.5
BUILDING PROCESS 1	3.75
DIGITAL TOOLS 1	3.75*
ENGINEERING METHODS 1	3.75
NATURAL SCIENCE 1-3	22.5
URBANPLANNING	7.5
SKETCHING AND DESIGN 1	7.5

YEAR 2	ECTS
STRUCTURAL MECHANICS AND STRENGTH OF MATERIALS	7.5
BUILDING DESIGN	7.5*
BUILDING TECHNOLOGY 1	7.5
DIGITAL TOOLS 2	3.75*
ENGINEERING METHODS 2	3.75
STRUCTURAL ENGINEERING 1	7.5
LINEAR ALGEBRA	7.5
ELEMENTARY SURVEYING	3.75
CONSTRUCTION MANAGEMENT	7.5
SKETCHING AND DESIGN 2	3.75

YEAR 3	ECTS
ARCHITECTURE AND TECHNOLOGY	7.5*
BUILDING PROCESS 2	3.75
BUILDING TECHNOLOGY 2	3.75
DIGITAL MODELING OF BUILDINGS	7.5
FINAL PROJECT WORK	15*
SUSTAINABLE DESIGN	7.5
BUILDING SERVICE 1	3.75
CALCULUS	7.5

YEAR 3, ELECTIVE COURSES	ECTS
ACCOUNTING	7.5
HISTORY OF ARCHITECTURE 2	3.75
DETAIL DESIGN	7.5*
CONSTRUCTION MANAGEMENT LAW	7.5
PROPERTY MANAGEMENT	7.5
RESEARCH AND INQUIRY METHODOLOGY	7.5*
BUILDING SERVICE 2	3.75
COST ACCOUNTING	7.5
INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP	7.5
ORGANISATION, LEADERSHIP AND CHANGE	7.5
QUALITY AND ENVIRONMENTAL MANAGEMENT SYSTEMS	7.5
PRESENTATION AND VISUALISATION TECHNICS WITH COMPUTER AID	7.5
TECHNICAL ENGLISH	7.5*
GERMAN	7.5
PROJECT: STRUCTURAL ENGINEERING OR DESIGN AND ARCHITECTURE	7.5*

GENERAL COURSES IN ENGLISH	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH
All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

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BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

180 ECTS WEB DEVELOPMENT/PROGRAMMING AND COMPUTER NETWORKS

A programme for developers of tomorrow's computer networks and information systems. Following the degree programme, the student has plenty of scope to redefine the borders and force the pace of technological development. Potential areas of employment include IT/network management, programming, systems management, systems design, IT instruction and sales. The IT focus opens a number of doors in a rapidly expanding field in great need of qualified personnel. After the first year of study two specialisations are offered: Web Development or Programming and Computer Networks.

YEAR 1	ECTS
COMPUTER SCIENCE AND PC TECHNOLOGY	7.5
DATABASE SYSTEMS AND APPLICATIONS	7.5
DISCRETE MATHEMATICS	7.5
ENGINEERING METHODS 1	3.75
NATURAL SCIENCE 1-3	22.5
INTRODUCTION TO PROGRAMMING	7.5*
SUSTAINABLE TECHNOLOGY	3.75

YEAR 2	ECTS
APPLIED NETWORKING	7.5
OBJECT ORIENTED ANALYSIS AND DESIGN	7.5
WEB PROGRAMMING	3.75
LINEAR ALGEBRA	7.5
CALCULUS	7.5
ENGINEERING METHODS 2	3.75
WEB PROGRAMMING /webdevelopment/	3.75
PROGRAMMING WITH GRAPHICAL COMPONENTS	7.5
PROJECT OF SYSTEM DEVELOPMENT	3.75
WEB DESIGN	3.75

YEAR 2	ECTS
/programming and computer networking/	
DATA STRUCTURES AND ALGORITHMS	7.5
OBJECT ORIENTED PROGRAMMING	7.5
BASIC DIGITAL ELECTRONICS	3.75
DIGITAL ELECTRONICS	3.75

YEAR 3	ECTS
INFORMATION SECURITY	7.5*
OPERATING SYSTEMS	7.5
FINAL PROJECT WORK	15*
ELECTIVE COURSES	15
/webdevelopment/	
SYSTEMS ANALYSIS AND DESIGN WITH A CONCEPT OF QUALITY	7.5*
DATABASE/INTERNET	7.5
/programming and computer network/	
COMPUTER NETWORK	7.5
PROGRAMMING PROJECT	7.5

YEAR 3, ELECTIVE COURSES	ECTS
ACCOUNTING	7.5
ANIMATION AND FINE ARTS	7.5
COST ACCOUNTING	7.5
RESEARCH AND INQUIRY METHODOLOGY	7.5*
TECHNICAL ENGLISH	7.5*
INTERACTIVE MULTIMEDIA	7.5
DATABASE SYSTEMS AND APPLICATIONS	7.5
COMPUTER GRAPHIC AND MEDIA TECHNOLOGY	7.5*
INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP	7.5
ORGANISATION, LEADERSHIP AND CHANGE	7.5
MOBILE APPLICATIONS	7.5*
APPLICATIONS FOR MOBILE DEVICES	7.5*
RELATIONAL DATABASES	7.5*

GENERAL COURSES IN ENGLISH	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH
All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

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BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

180 ECTS EMBEDDED SYSTEMS

Most electronics today contains one or more microprocessors. Many systems require the programming skills of a computer engineer. However, to be successful in programming embedded systems, hardware knowledge is a necessity. This programme provides an education in the computer engineering field, with the strong emphasis on embedded systems, combined with the electronics courses that are necessary to understand the hardware surrounding the processor. Examples of applications are entertainment systems, mobile phones, automotive products and safety critical airborne equipment.

YEAR 1	ECTS
DIGITAL ELECTRONICS	3.75
BASIC DIGITAL ELECTRONICS	3.75
ANALOGUE ELECTRONICS	3.75
DISCRETE MATHEMATICS	7.5
ENGINEERING METHODS 1	3.75
INTRODUCTION TO ELECTRONICS	3.75
INTERACTION DESIGN	3.75
NATURAL SCIENCE 1-3	22.5
INTRODUCTION TO PROGRAMMING	7.5*

YEAR 2	ECTS
DATA STRUCTURES AND ALGORITHMS	7.5
DIGITAL ELECTRONICS DESIGN	7.5*
SIGNAL PROCESSING	7.5
MICROCONTROLLERS	7.5
ENGINEERING METHODS 2	3.75
LINEAR ALGEBRA	7.5
OBJECT ORIENTED ANALYSIS AND DESIGN	7.5
OBJECT ORIENTED PROGRAMMING	7.5
SUSTAINABLE TECHNOLOGY	3.75

YEAR 3	ECTS
COMPUTER NETWORK	7.5
FINAL PROJECT WORK	15*
CALCULUS	7.5
MECHATRONICS	7.5
MICROCOMPUTER SYSTEMS	15
OPERATING SYSTEMS	7.5

YEAR 3, ELECTIVE COURSES	ECTS
ACCOUNTING	7.5
RESEARCH AND INQUIRY METHODOLOGY	7.5*
COST ACCOUNTING	7.5
TECHNICAL ENGLISH	7.5*
GERMAN	7.5
INFORMATION SECURITY	7.5*
INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP	7.5
ORGANISATION, LEADERSHIP AND CHANGE	7.5
MOBILE APPLICATIONS	7.5*
REAL TIME OPERATING SYSTEMS	7.5*

GENERAL COURSES IN ENGLISH	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH
All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

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180 ECTS LOGISTICS AND MANAGEMENT

Logistics and Management is a program for you who are interested in operations management with deepened knowledge within logistics. Important subjects within these areas are combined and treated from a strategic, tactical as well as operational perspective. The program provides deep knowledge of how to design, plan and control materials flows and services and broad knowledge of how to build up, manage and develop an industrial business.

YEAR 1	ECTS
CALCULUS	7.5
COMPUTER TOOLS	3.75
COST ACCOUNTING	7.5
ENGINEERING METHODS 1	3.75
ENTERPRISE LOGISTICS	7.5
INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP	7.5
NATURAL SCIENCE IL 1	7.5
OPERATIONS STRATEGY	7.5
SYSTEM AND PROCESS ANALYSIS	7.5

YEAR 2	ECTS
DISTRIBUTION AND TRANSPORTATION LOGISTICS	7.5
ENGINEERING METHODS 2	3.75
FLOW SIMULATION	3.75
INDUSTRIAL INQUIRY METHODOLOGY	7.5
LINEAR ALGEBRA	7.5
NATURAL SCIENCE IL 2	7.5
MATHEMATICAL STATISTICS	7.5
ORGANISATION, LEADERSHIP AND CHANGE	7.5
PRODUCTION LOGISTICS	7.5

YEAR 3	ECTS
ENVIRONMENT AND CHEMISTRY	7.5
ERP	7.5
FINAL PROJECT WORK	15
OPERATIONS MANAGEMENT AND CONTROL	15
PRODUCT REALISATION	7.5
PURCHASING AND SUPPLY CHAIN MANAGEMENT	7.5*

YEAR 3, ELECTIVE COURSES	ECTS
ACCOUNTING	7.5
COMMERCIAL LAW	7.5
GERMAN	7.5
LEADERSHIP AND COMMUNICATION	7.5
MANAGEMENT OF TECHNOLOGY	7.5
MARKETING MANAGEMENT	7.5
MICRO ECONOMIC PRINCIPLES	7.5
RESEARCH AND INQUIRY METHODOLOGY	7.5*
TECHNICAL ENGLISH	7.5*
WORK-HUMAN-TECHNOLOGY	7.5*

GENERAL COURSES IN ENGLISH	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH

All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

PROGRAMME HEAD

Per Hilletofth, Tel: + 46 36-10 16 48,
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180 ECTS INDUSTRIAL AND PRODUCTION MANAGEMENT

It is not uncommon for an engineering graduate sooner or later to end up in a job which, apart from technical know-how, also calls for knowledge of economics and production, as well as organization and leadership.
This degree program combines economics with technical aspects. Students receive the knowledge required for careers in such areas as investment planning, industrial marketing, and corporate operation and development.

YEAR 1	ECTS
APPLIED PHYSICS	7.5
INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP	7.5
ENGINEERING METHODS 1	3.75
LINEAR ALGEBRA	7.5
CALCULUS	7.5
CALCULUS OF SEVERAL VARIABLES	7.5
ENGINEERING MATERIALS	7.5
TECHNICAL DRAWING AND VISUALISATION	3.75
MANUFACTURING TECHNOLOGY	7.5

YEAR 2	ECTS
ENERGY TECHNOLOGY	7.5
SOLID MECHANICS	7.5
ENGINEERING METHODS 2	3.75
COST ACCOUNTING	7.5
DESIGN METHODS IN MECHANICAL ENGINEERING	7.5
MECHANICS	7.5
SUSTANIABLE TECHNOLOGY	3.75
PROGRAMMING AND AUTOMATION	7.5
MANUFACTURING SYSTEM AND PRODUCTION MANAGEMENT	7.5

YEAR 3	ECTS
FINAL PROJECT WORK	15*
MARKETING MANAGEMENT	7.5
ORGANISATION, LEADERSHIP AND CHANGE	7.5
PURCHASING AND SUPPLY CHAIN MANAGEMENT	7.5*
QUALITY AND ENVIRONMENTAL MANAGEMENT SYSTEMS	7.5

YEAR 3, ELECTIVE COURSES	ECTS
ACCOUNTING	7.5
APPLIED FOUNDRY TECHNOLOGY	7.5
CAD - BASIC SOLID MODELLING	7.5*
COMMERCIAL LAW	7.5
COMPONENT CASTING WITH SIMULATION	7.5*
COST ACCOUNTING	7.5
DISTRIBUTION AND TRANSPORTATION LOGISTICS	7.5
FLEXIBLE MANUFACTURING SYSTEMS WITH SIMULATION	7.5
MANAGEMENT OF TECHNOLOGY	7.5
MATERIALS AND SIMULATION	6
MATHEMATICAL STATISTICS	7.5*
MECHATRONICS M	7.5*
RESEARCH AND INQUIRY METHODOLOGY	7.5*
TECHNICAL ENGLISH	7.5*
VISUALIZATION IN COMPUTER	7.5
WORK-HUMAN-TECHNOLOGY	7.5*

GENERAL COURSES IN ENGLISH	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH
All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

PROGRAMME HEAD
Jörgen Dernroth, Tel: + 46 36-10 16 32,
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180 ECTS PRODUCT DEVELOPMENT AND INDUSTRIAL DESIGN

Design is increasing in significance as a competitive tool, where the technology in various products is becoming more and more difficult to distinguish. Products need to be able to offer added value in the form of an attractive, well thought-out exterior design and recyclability, as well as offering functions, which are user-friendly and ergonomically advanced. This degree programme arms the student with knowledge of the entire product development process, as well as development concepts and methods from a company-wide perspective.

YEAR 1	ECTS
APPLIED PHYSICS	7.5
CALCULUS	7.5
CALULUS OF SEVERAL VARIABLES	7.5
ENGINEERING MATERIALS	7.5
ENGINEERING METHODS 1	3.75
LINEAR ALGEBRA	7.5
MANUFACTURING TECHNOLOGY	7.5
SOLID MODELLING	3.75
SUSTAINABLE TECHNOLOGY	3.75
TECHNICAL DRAWING AND VISUALISATION	3.75

YEAR 2	ECTS
SOLID MECHANICS	7.5
ENGINEERING METHODS 2	3.75
DESIGN METHODS IN MECHANICAL ENGINEERING	7.5
MECHANICS	7.5
PRODUCT DEVELOPMENT AND MECHANICAL DESIGN	7.5
PRODUCT DEVELOPMENT AND MATERIALS SELECTION	7.5
PRODUCT DEVELOPMENT	3.75

YEAR 3	ECTS
FINAL PROJECT WORK	15*
INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP	7.5
QUALITY AND ENVIRONMENTAL ASSURANCE OF PRODUCT DEVELOPM.	7.5
/materials and manufacturing year 2 and 3/	
ENERGY TECHNOLOGY	7.5
COMPONENT CASTINGS	7.5*
MATERIALS AND FAILURE ANALYSIS	7.5*
MATERIAL TESTING AND CHARACTERISATION	7.5*
/engineering design with computer support year 2 and 3/	
COMPUTER SUPPORTED ENGINEERING DESIGN USING CAD	7.5
APPLIED FINITE ELEMENT ANALYSIS	7.5*
ENERGY TECHNOLOGY	7.5
PROGRAMMING	7.5
/industrial design year 2 and 3/	
COMPUTER AIDED VISUALISATION	7.5
INDUSTRIAL DESIGN THEORY	7.5
PRACTICAL DESIGN KNOWLEDGE	7.5
PRODUCT DEVELOPMENT AND INDUSTRIAL DESIGN	7.5

YEAR 3, ELECTIVE COURSES	ECTS
ACCOUNTING	
7.5	
APPLIED FOUNDRY TECHNOLOGY	7.5
CAD - BASIC SOLID MODELLING	7.5*
COMMERCIAL LAW	7.5
COMPUTER AIDED VISUALIZATION	7.5
COMPONENT CASTINGS WITH SIMULATION	7.5
COST ACCOUNTING	7.5
MATERIALS AND SIMULATION	6
MATHEMATICAL STATISTICS	7.5*
MECHATRONICS M	7.5*
ORGANISATION, LEADERSHIP AND CHANGE	7.5
PROGRAMMING AND AUTOMATION	7.5
RESEARCH AND INQUIRY METHODOLOGY	7.5*
SIMULATION OF RIGID BODY SYSTEM	7.5*
TECHNICAL ENGLISH	7.5*

GENERAL COURSES IN ENGLISH	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH
All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

PROGRAMME HEAD
Mikael Cederfeldt Tel: + 46 36-10 16 71,
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120/ 180 ECTS GRAPHICAL DESIGN AND WEB DEVELOPMENT

Our apprehension of a company is deeply affected by their ability to make use of visual communication. Branding, graphic concepts and not the least web design are all important factors in creating a strong trademark and consumer awareness. The contents of the websites of a company must be presented in a stylish manner and in line with the target group, but also with feasible and effective technique that might even have to suit mobile phones, PDA and other platforms. Interactivity and animated graphics are often required to reach the desired result and attract the right target group.

YEAR 1	ECTS
BASIC MARKETING	7.5
BASICS OF MODERN PHOTOGRAPHY	3,5
COMMUNICATION AND PROJECT METHODS	7.5
GRAPHIC DESIGN	15
INTERACTIVE MULTIMEDIA	7.5
INTERFACE DESIGN	4
MATHEMATICAL TOOLS	7.5
WEB PROGRAMMING WITH DATABASES	7.5

YEAR 2	ECTS
BASIC MARKETING 2	7.5
3D COMPUTER GRAPHICS	7,5
DEVELOPMENT PROJECT	7.5
ENTERPRISE KNOWLEDGE AND BUSINESS PLAN	7.5
WORKPLACE BASED PROJECT	15

YEAR 2, ELECTIVE COURSES	ECTS
ANIMATION AND FINE ARTS	7,5
GRAPHIC DESIGN 2	7.5
MARKETING AND SALES TECHNIQUE	7.5
PRODUCT VISUALISATION AND DESIGN	7.5
WEB GAME DEVELOPMENT	7.5
MOBILE APPLICATIONS	7.5*
APPLICATIONS FOR MOBILE DEVICES	7.5*

YEAR 3, ADDITIONAL YEAR	ECTS
APPLICATION OF TECHNOLOGY IN COLLABORATIVE PROJECT	15
FINAL PROJECT WORK	15
INQUIRY METHODOLOGY	7.5
LEADERSHIP COMMUNICATION	7.5
ORGANISATION, LEADERSHIP AND CHANGE	7.5
PROJECT MANAGEMENT AND BUSINESSMANSHIP	7.5

FOR INTERNATIONAL STUDENTS	ECTS
PHYSICS AND SIMULATIONS	7.5*
INTERCULTURAL AND INTERNATIONAL COMMUNICATION	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 1	7.5*
SWEDISH LANGUAGE, CULTURE AND SOCIETY 2	7.5*

COURSES IN ENGLISH
All courses marked with an asterix (*) are held in English. For detailed information, see the course list on page 16-17.

PROGRAMME HEAD
Kristin Trulsson Tel: + 46 36-10 15 84
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120 ECTS INFORMATION ENGINEERING AND MANAGEMENT

This is a two years Master's programme that aims at bringing together students with business and technology background to provide them with knowledge on approaches where information technology is a driving force for successful business operation. Information systems and business applications are essential part of business processes nowadays. However, information systems are not isolated, rather they function in a business context of an enterprise and operated by the enterprise personnel. Only when all parts of this complex socio-technical system work well it brings the business most benefit. Achieving this requires understanding of two perspectives: management of business processes as well as engineering of information systems to support them.

In an economy with an increasing part of knowledge-intensive services and products, the importance of software solutions for competitiveness of modern enterprises will increase even more. These software systems support all kinds of tasks emerging in an enterprise. This is why IT specialists with a sound background in systems architecture or software management, even in times of reduced IT budgets, have good job opportunities.

The specialization Information Engineering and Management aims at building up specialist competence in the software area. Development of software solutions for business purposes has been a major objective of information technology during the last decades. Addressing this task requires on the one hand a deep understanding of requirements and frame conditions in the organization and, on the other hand, a solid background in methods, technologies and systems for software development and information modelling.

The specialization Information Engineering and Management of this Master's programme was developed for graduates with a Bachelor of Computer Science. The education will prepare you for work in development departments in large enterprises as well as in small and medium-sized companies. If you are interested in a career in research contexts, the programme will provide a solid basis for future research work.

You will enhance and widen your knowledge in the areas of software engineering, information and enterprise modelling, and distributed applications. You will also deepen your knowledge of database systems, software quality and project management. In complex and real-world projects you will learn how to use modelling tools and software production environments for the complete system development process. You will also get insight in how information systems function in a business context and affect the economics of an enterprise. Based on this experience you will be able to work in various positions, e.g. project manager for system development, system analysts, system developer, service and maintenance or customer service. This can also form the basis for starting up your own business.

At the end of your studies, would you like to have a final thesis with a strong connection to research or do you prefer an industrial context? – Your choice! An extensive network of host companies and a close integration with our research groups in computer engineering facilitate both options.

SEMESTER 1	ECTS
DATABASE SYSTEMS AND TRENDS	7*
DEVELOPMENT OF DISTRIBUTED APPLICATIONS	7*
KNOWLEDGE MODELLING AND KNOWLEDGE MANAGEMENT	7*
MULTICULTURAL COMPETENCE	1.5
RESEARCH AND INQUIRY METHODOLOGY	7.5*

SEMESTER 2	ECTS
ENTERPRISE MODELLING	7.5*
ENTREPRENEURIAL PREFORMANCE MANAGEMENT AND IT	7.5*
INFORMATION RETRIEVAL	7.5*
SOFTWARE ENGINEERING METHODS	7.5*

SEMESTER 3	ECTS
SOFTWARE QUALITY AND PROJECT MANAGEMENT	7.5*
INFORMATION LOGISTICS	7.5*
ELECTIVE COURSES	15*

SEMESTER 4	ECTS
FINAL PROJECT THESIS, MASTER	30*

PREREQUISITES

- A Bachelor in Computer Science from a recognised university.
- At least 90 ECTS in your major subject Computer Science.
- The Bachelor's Degree should comprise a minimum of 22,5 ECTS in Mathematics.
- The program runs in English and is also open for freemover students. Information about admission, see www.jth.ju.se/eng.

* Courses open for exchange students.

PROGRAMME HEAD

Vladimir Tarasov, Tel: + 46 36-10 15 91,

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120 ECTS PRODUCTION DEVELOPMENT AND MANAGEMENT

The manufacturing industry now faces globalisation challenges and this is the starting point of this Master's programme. The aim is to provide knowledge and competence that prepare the students for leading positions within the manufacturing industry.

Today, the manufacturing industry is an international industry. Product development and production may be carried out at different geographic locations, which require communication and coordination of the activities. The competitiveness of manufacturing companies relies to a high degree on their abilities to benefit from the increased globalisation.

This Master's programme focuses on the role that production plays within manufacturing companies. Central themes include how production systems are developed, how the design of the products and the supply chain interrelate with the production system design, and how production systems are operated and managed. The program is based on a systems perspective that gives the students a holistic understanding of the role production plays in a company's business activites. It ends with a final project work, at which the students apply the knowledge and skills gained during the programme.

An underlying idea of the programme is that the students are given the opportunity to connect theory with practice. Therefore a major part of the education is carried out in the project form. This provides the students with possibilities to relate their theoretical understanding to the real conditions of the manufacturing industry.

The programme is led by a steering group that includes persons representing leading positions in industry, students and teachers. The steering group ensures the relevance and quality of the education.

Production Development and Management already follows the structure for academic courses that will be implemented within the European Union. The teaching language is English and an international perspective is adopted throughout the programme.

A student that has graduated from Production Development and Management is ready to take up various positions in industry, including areas such as production development, production management, production planning, or logistics. The student will also be prepared for doctoral studies.

SEMESTER 1	ECTS
COMPETITIVE PRODUCTION	7.5*
OPERATION STRATEGY	7.5*
PRODUCTION SYSTEMS DEVELOPMENT	7.5*
LEADERSHIP	6*
MULTICULTURAL COMPETENCE	1.5

SEMESTER 2	ECTS
HUMAN FACTORS ENGINEERING	15
INTEGRATED PRODUCT AND PRODUCTION DEVELOPMENT	7.5*
PRODUCTION MANAGEMENT	7.5
SUPPLY CHAIN MANAGEMENT	7.5*

SEMESTER 3	ECTS
SUSTAINABLE PRODUCTION SYSTEMS	7.5
RESEARCH AND INQUIRY METHODOLGY	7.5*
PROJECT WORK/ELECTIVE COURSE	7.5
PROJECT MANAGEMENT	7.5

SEMESTER 4	ECTS
FINAL PROJECT WORK, MASTER	30*

PREREQUISITES

- A Bachelor of Science in Industrial Engineering and Management or Mechanical Engineering from a recognised university
- At least 90 ECTS in your major subject according to above.
- The Bachelor's Degree should comprise a minimum of 22,5 ECTS in Mathematics.
- The program runs in English and is open for freemover students. Information about admission, see www.jth.ju.se/eng.

*Courses open for exchange students.

PROGRAMME HEAD

Glenn Johansson Tel: + 46 36-10 16 34,

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120 ECTS PRODUCT DEVELOPMENT AND MATERIALS ENGINEERING

Because competition between companies is getting tougher as the number of products on the market increases, many are realising the importance of product development and material knowledge as a competitive means. This programme covers the entire product development process, from conceptual engineering design to materials and manufacturing processes.

The work of engineers within product development is creative and offers a great deal of variety. This programme qualifies students for positions with the manufacturers and suppliers that develop and produce components or as consultants. Emphasis is placed on design and construction of technical components and products as regards customer demands, use, producibility and production methods. Vehicles, household appliances, medical equipment and certain sporting goods are all examples of products made up of complex components.

The steady increase in the use of computer support makes possible new methods, which are parallel to the entire product development process. With the help of advanced computer tools in design and construction, real and virtual prototypes can be produced much faster, and the time needed for development can be shortened. In addition, a product can be studied and tested at an early stage of product development for its design, usability, durability, safety and producibility. Important aspects of work with the development of components and products include the analysis of function and performance, the choice of materials and the methods of production. This programme gives an understanding of the theory behind and the practical use of the computer based tools needed for these tasks.

Some of the courses include project work. Students can, in smaller groups, analyse and make suggestions regarding real-life problems taken straight from the industry. Guest speakers from the field also take part in instruction. A thesis at the end of the programme helps students apply their theoretical knowledge and gain insight as to the research and development within the industry and the university. Extensive knowledge about materials is also acquired. The School of Engineering has well-equipped research labs for materials engineering and computer simulation.

SEMESTER 1	ECTS
COMPUTER PROGRAMMING FOR DESIGN AUTOMATION	7.5*
CONCEPTUAL ENGINEERING DESIGN	7.5*
INTRODUCTION TO INDUSTRIAL DESIGN	6*
MATERIALS AND DESIGN	7.5*
MULTICULTURAL COMPETENCE	1.5

SEMESTER 2	ECTS
ADVANCED CASTING MATERIALS PROCESSING	7.5*
INTEGRATED PRODUCT DEVELOPMENT	7.5*
MATERIALS AND MANUFACTURING PROCESSES	7.5*
/elective courses	
APPLIED FINITE ELEMENT ANALYSIS	7.5*
SIMULATION OF RIDGID BODY SYSTEMS	7,5*

SEMESTER 3	ECTS
COMPUTER SUPPORTED ENGINEERING DESIGN	7.5*
MODELLING AND SIMULATION OF CASTING	7.5*
OPTIMIZATION DRIVEN DESIGN	7.5*
NON-LINEAR FINITE ELEMENT ANALYSIS	7.5

SEMESTER 4	ECTS
FINAL PROJECT THESIS, MASTER	30*

PREREQUISITES

- A Bachelor of Science in Mechanical Engineering from a recognised university
- At least 90 ECTS in your major subject Mechanical Engineering.
- The Bachelor's Degree should comprise a minimum of 22.5 ECTS in Mathematics.
- The program runs in English and is open for freemover students. Information about admission, see www.jth.ju.se/eng.

* Courses open for exchange students.

PROGRAMME HEAD

Lennart Elmquist, Tel: + 46 36-10 16 62

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120 ECTS INDUSTRIAL DESIGN

The programme provides the opportunity to broaden your knowledge and creativity within the area of industrial design. You will learn more about the whole design process from a human point of view, with a focus on usability, ergonomics, aesthetics, materials and production, as well as drafting techniques and visualisation.

The courses has an interdisciplinary approach and is guided by the relationship between humans and products. The programme provides students the opportunity to use a variety of tools to quickly visualize ideas and concepts in order to develop their creativity in the design studio and through model workshops. Students also learn to formulate and present ideas and solutions and identify new products and opportunities. A considerable part of this Master's programme is run in project form, implementing sharp projects in collaboration with a company.

The Master's programme with the specialisation in Industrial Design at School of Engineering is made up of two tracks, each of them running during two semesters/one year. The first year you study the track "The Man and the Product" and you will learn more about design communications, business and ergonomics. The second year's track is called "The Company and the Environment", and you will then focus on sharp projects within the area of industrial design.

On completion of the degree, you will be well prepared for work on industrial design projects, or as a consultant. If you are interested in a career in research contexts, the programme also provides a firm foundation for future research work.

SEMESTER 1**	**ECTS**
DESIGN COMMUNICATION 1	7.5
DESIGN PHILOSOPHY AND PRACTICE	7.5
INTRODUCTION TO INDUSTRIAL DESIGN	6*
MATERIALS AND DESIGN	7.5*
MULTICULTURAL COMPETENCE	1.5

SEMESTER 2**	**ECTS**
BUSINESS AND ECONOMICS	7.5
DESIGN COMMUNICATION 2	7.5
ERGONIMICS	7.5
HUMAN LIGHT AND SPACE	7.5

SEMESTER 3**	**ECTS**
DESIGN COMMUNICATION 3	10.5
DESIGN RESEARCH METHODOLOGY	4.5
INDUSTRIAL DESIGN PROJECT	15

SEMESTER 4**	**ECTS**
FINAL PROJECT THESIS, MASTER	30*

PREREQUISITES

- A Bachelor of Science in Mechanical Engineering (or equivalent) from a recognised university
- At least 90 ECTS in your major subject Mechanical Engineering.
- The Bachelor's Degree should comprise a minimum of 22.5 ECTS credits in Mathematics.
- The program runs in English and is open for freemover students. Information about admission, see www.jth.ju.se/eng.

* Courses open for exchange students.

PROGRAMME HEAD

Lars Eriksson, Tel: + 46 36-10 16 68

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**Students interested in taking courses within Industrial Design can only do this if a complete semester is chosen. The students must be admitted to a program in Industrial Design within Mechanical Engineering at the home university. Applicants must attach their portfolio to the exchange application and also do an application assignment, see on the website http://hj.se/jth/en/education/master-of-science/industrial-design.html. Limited number of places.

ARCHITECTURE AND TECHNOLOGY - 7.5 ECTS

ARKITEKTUR OCH TEKNIK BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TATC17. OBJECTIVES: To give students knowledge in the basis of planning and design of public buildings with respect to functional, aesthetics, technical, environmental, sustainable and historical aspects. Provide an understanding of the relationship between form and structure and between architectural form and material and the design of details. CONTENTS: Planning and design of public buildings where the students make a proposal for a complex public building in a given context with a specific program. An understanding of functional and technical demands and analysis of the context. Training and understanding of the design process. Training and understanding in the relationship between a chosen form and different structures. Architectural theories and the perception of spaces. LEARNING OUTCOMES: After completion of the course the student should: Have the knowledge, and be able to give an account, of the planning and design for different types of activities. Have the knowledge, and be able to give an account, of the demands and needs for planning in the form of an activity description, building program and connection schedule. Have the knowledge of, and be able to show the ability to handle a building program with functional analysis and internal and external connection requirements. Have the knowledge of, and be able to show the ability to understand, conditions for spaces and the connections to its surroundings. Have knowledge of and be able to show the ability to weigh-up aesthetical, design and technical, environmental, sustainable and historically cultural aspects to an architectural whole. Have an understanding for and show the ability to apply a structured planning and design method in the different phases of the process. Have the knowledge, and be able to give an account, of the connection between material and design questions and the shaping of architectural whole and the design of details. Be able to describe and analyse how different types of structural systems affects the architectural form. Have an understanding for and be able to describe different architectural theories and perception of spaces and their influence on the architectural form. Have an understanding for and be able to describe different materials properties and capabilities in the design of the building´s exterior skin and its inner spaces. Have an understanding for and be able to describe how solutions for indoor climate, installation systems, lighting and sound issues affect the design and solutions. Show the ability to – with and without digital tools, in words and images – visualise, present and communicate proposals for a complex building. PREREQUISITES/QUALIFICATIONS: Completed course in Building Design 7.5 credits, Building Technology part 1 7.5 credits or equivalent. TEACHING METHODS: Lectures, seminars and project work. The language of tuition will be in English when international students participate in the course. EXAMINATION AND GRADES: Project work (7.5 credits). The grades for the project and the course as a whole are: fail, 3, 4, and 5 and ECTS-grades. Compulsory attendance is required for all seminars and for 80% of lectures. LITERATURE: According to separate bibliography.

BUILDING DESIGN - 7.5 ECTS

BYGGNADSUTFORMNING BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TBUB17. OBJECTIVES: To give students basic knowledge in the planning of residential buildings with respect to functional, environmental, aesthetics, sustainable and historical aspects. To take account of economic and community-related criteria. To provide an orientation about other types of buildings. To provide knowledge about the design process, its methods, and its implementation. CONTENTS: Building history (the architectural and historical development of various building types). The planning and design of buildings (building types, criterias of quality , the planning and design of dwellings, sustainable questions in buildings). Supplements to the building frame and rooms (function and design aspects as regards stairs, interior fittings, installations, etc. windows, doors, balconies). Legislation (criteria and demands for buildings, contacts with authorities). Design methodology (sketch design and presentation of buildings). Documents for planning and building permissions. LEARNING OUTCOMES: After completion of the course the student should: Be able to describe housing construction in a societal process, from idea and planning to the shaping of the physical environment. Be able to give an account of Swedish and European housing history from a architectural, technical and social perspective. Single-handedly be able to design and shape a multiple-resident block on the basis of functional and technical requirements and aesthetical values, aiming towards a long-term sustainable societal construction. Be familiar with Swedish legislation and Swedish standards that govern housing construction. Be able to formulate documents for building permits and planning permissions. PREREQUISITES/QUALIFICATIONS: Completed courses in Building technology 1, 7.5 credits, together with Town Planning 7.5 credits, or the equivalent. TEACHING METHODS: Teaching will be given in the form of lectures, study visits, exercises and project work. The language of tuition will be in English when international students participate in the course. EXAMINATION AND GRADES: Examination (3.75 credits) and Project Work (3.75 credits). The grades used for the examination and the course as whole will be: Fail, 3, 4 and 5 and ECTS-grades. The grades used for the project work will be either Pass or Fail. LITERATURE: According to separate bibliography.

DIGITAL TOOLS I - 3.75 ECTS

DIGITALA VERKTYG I BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TD1G12. OBJECTIVES: To provide basic skills in the use of digital information technology in the preparation of digital models and images in the modeling and visualization work. To provide knowledge on the application of digital technology and industry-specific applications area. To give students basic knowledge in the basic skills in the use of computer software in drawing and design work. To give knowledge about the application of computer software and specific applica-

tions in the subject area. CONTENTS: The course covers the following topics: Introduction to the current program and object-oriented tools, their structure and interface, Modeling and principles for drawing technique, Object Oriented Modeling, Creation of 2D drawings from the current 3D model, Drawing creation of Swedish Standard, Imports of external materials, external references, Inventory management and plotting, Custom software applications, Introduction to visualization and presentation work. LEARNING OUTCOMES: After completion of the course the student should: Have basic knowledge of the most common computer-based modeling and drawing tools in the field. Have basic proficiency in the use of an appropriate software and digital information technology at modeling and design work in the field. Basic knowledge of modeling and principles for drawing technique. Be able to create 2D drawings of Swedish Standard from the current model. Create model files, plan definition files and plot files. Be able to use external material and references. Be able to upload and use the system for inventory management. Be aware of additional applications for modeling and design work in the field. Have basic skills in visualization and presentation in the subject area. PREREQUISITES/QUALIFICATIONS: General entry requirements and English B, Mathematics C and Civics A (Field-specific requirements 4)and required grade Passed. Exemption from entry requirements in English B and Civics A. TEACHING METHODS: Lectures and exercises. The language of tuition will be in English when international students participate in the course. The teaching is conducted in English. EXAMINATION AND GRADES: Exercise (3.75 credits). The course is graded Fail (U), 3, 4 or 5 and ECTS-grades. LITERATURE: According to separate bibliography.

DIGITAL TOOLS 2 - 3.75 ECTS

DIGITALA VERKTYG I BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TD2K11. OBJECTIVES: To provide enhanced skills in the use of digital information technology in producing digital models and images of sketches, drawings, visualization, and presentation work. To provide knowledge on the application of digital technology and industry-specific applications in the field. To provide knowledge and skills in the use of object-oriented 3D modeling where the model is information carrier through the entire design and production process and lifetime of the building. . CONTENTS: The course covers the following topics: Enhancement of use of current programming and object-oriented tools. Depth object-oriented modeling. BIM (Building Information Modelling). Model-oriented design with digital tools. IFC (Industry Foundation Classes) and its applications in the field. The model's usefulness in the calculation and production. Digital-delivery specifications. Visualization and image generation from model. Digital images of communication during the design, construction and management. LEARNING OUTCOMES: After completion of the course the student should: Have in-depth knowledge of the most common computer-based modeling and drawing tools in the field. Jave in-depth skills in the use of relevant software and digital information technology for modeling and design work in the field. Basic knowledge of BIM (Building Information Modeling) and its usage. Have knowledge of model-oriented design. Have knowledge of IFC and the potential for document exchange through a neutral format. Have knowledge of the models' usefulness in quantifying, area calculations, etc. for production. Performance digital delivery specifications. Have skills in visualization and generating images from a model. PREREQUISITES/QUALIFICATIONS: General entry requirements and completed course Digital Tools 1, 3,75 credits (or the equivalent). TEACHING METHODS: Lectures and exercises. EXAMINATION AND GRADES: Exercise (3.75 credits). The course is graded Fail (U) or Pass (G). LITERATURE: According to separate bibliography.

DETAIL DESIGN - 7.5 ECTS

BYGGNADSPROJEKTERING BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TBPC17. OBJECTIVES: To provide a comprehensive picture of, and in-depth knowledge of design methods using modern aids such as computers. To provide knowledge about interrelated problems in the design process regarding functional, structural and sustainable aspects in relation to economic and aesthetic factors. CONTENTS: Computer-aided design methods: Plain and control a project with attention to coordination and quality assurance - Complex problem-solving using a computer, based on a brief or program, design a building from the point of view of functionally, aesthetics and economic aspects - Produce general estimates for the selection of the structural system, selection of material , spans etc. Perform overall calculations (structure, energy, fire, noise and moisture). Detail design for architects and construction engineers: Based on the outline drawings produce construction drawings such as dimensional drawings, detail drawings and building specifications - Produce drawings of the structure, design details and undertake structural calculations. LEARNING OUTCOMES: After completion of the course the student should: Have an understanding of and be able to show the ability to apply a structured planning methodology in the different phases of the design process. Have an understanding of and show the ability to plan and direct a project with emphasis on coordination and quality assurance. Have knowledge of and be able to show the ability to project and solve complex problems with computer aids. Be able to analyse and select structural systems and construction techniques with detailed solutions on the basis of chosen projects and applicable conditions. Be able to analyse and generally select installations and heating systems with system solutions. Have knowledge of, and be able to give an account of, the dimensioning process for selected designs. Have knowledge of, and be able to give an account of, dimensioning and choice of construction techniques with concern to energy, fire, noise and moisture. Be able to show planning skills of construction documents for (A) architects of a project with relevant computermodels, drawings and descriptions. Be able to show planning skills of construction documents for (K) construction engineers of a project with relevant computermodels, drawings, descriptions and calculations. Have an understanding of and be able to conduct a general cost assessment for chosen projects. PREREQUISITES/QUALIFICATIONS: Completed 7.5 credits courses in Building Design, Building Technology part 1 and 2, Steel and Timber Structures, or Structural Techniques, or the equivalent. TEACHING METHODS: Lectures, seminars and project work. The language of tuition will be in English when international students participate in the course. EXAMINATION AND GRADES: Project work (7.5 credits). The grades for the project and the course as a whole are: Fail, 3, 4, and 5 and ECTS-grades. Compulsory attendance is required for all seminars and for 80% of lectures. LITERATURE: According to separate bibliography.

PROJECT WORK - ARCHITECTURE AND TECHNOLOGY - 7.5 ECTS

PROJEKTARBETE ARKITEKTUR OCH TEKNIK BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TATN11 OBJECTIVES: To carry out a project within the subject field, either on your own or as a part of a group. This project may comprise design work, analyses, planning work, or similar. The project work intends to develop the students' abilities to use their acquired knowledge from the course critically. The work can be carried out in co-operation with companies, organisations or authorities. CONTENTS: Gathering and processing of data. Project planning. Carrying through the project. Writing reports. Reporting. LEARNING OUTCOMES: After completion of the course the student should: Be able to apply scientific methods and approaches to problem solving upon the implementation of a project task or study. Show the ability to critically apply the knowledge and skills that are expected during the education. Have deepened, broadened and further developed their knowledge within the main subject area of their education. Have developed their engineering mindset and be trained in independently solving problems. Show the ability to search, identify and analyse relevant information and knowledge. Show the ability to write a technically scientific report and to orally present its contents. Be able to shape and express knowledge through verbal communication, models, formulas and descriptive statistics. PREREQUISITES/QUALIFICATIONS: The Project Work may commence after approval from the head of department. General entry requirements and completed courses 90 credits in first cycle, corresponding to at least 60 credits within the major subject Structural Engineering (or the equivalent) TEACHING METHODS: The student will carry out, alone or in a group, a Project Work within the main subject area of their education. A supervisor and examiner will be appointed for every Project Work. The project will be carried out following the directives established at the School of Engineering. EXAMINATION AND GRADES: The course is examined through a written project report, an oral presentation of the project report, opposition by another group or student, and compulsory attendance at another group's or students oral presentation. The course is graded Fail (U), 3, 4 or 5. LITERATURE: According to separate bibliography.

PROJECT WORK - DESIGN AND ARCHITECTURE - 7.5 ECTS

PROJEKTARBETE DESIGN OCH ARKITEKTUR BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: T1AN11 OBJECTIVES: To carry out a project within the subject field, either on your own or as a part of a group. This project may comprise design work, analyses, planning work, or similar. The project work intends to develop the students' abilities to use their acquired knowledge from the course critically. The work can be carried out in co-operation with companies, organisations or authorities. CONTENTS: Gathering and processing of data. Project planning. Carrying through the project. Writing reports. Reporting. LEARNING OUTCOMES: After completion of the course the student should: Be able to apply scientific methods and approaches to problem solving upon the implementation of a project task or study. Show the ability to critically apply the knowledge and skills that are expected during the education. Have deepened, broadened and further developed their knowledge within the main subject area of their education. Have developed their engineering mindset and be trained in independently solving problems. Show the ability to search, identify and analyse relevant information and knowledge. Show the ability to write a technically scientific report and to orally present its contents. Be able to shape and express knowledge through verbal communication, models, formulas and descriptive statistics. PREREQUISITES/QUALIFICATIONS: The Project Work may commence after approval from the head of department. General entry requirements and completed courses 90 credits in first cycle, corresponding to at least 60 credits within the major subject Structural Engineering (or the equivalent). TEACHING METHODS: The student will carry out, alone or in a group, a Project Work within the main subject area of their education. A supervisor and examiner will be appointed for every Project Work. The project will be carried out following the directives established at the School of Engineering. EXAMINATION AND GRADES: The course is examined through a written project report, an oral presentation of the project report, opposition by another group or student, and compulsory attendance at another group's or students oral presentation. The course is graded Fail (U), 3, 4 or 5. LITERATURE: According to separate bibliography.

PROJECT WORK - DESIGN AND ARCHITECTURE - 15 ECTS

PROJEKTARBETE DESIGN OCH ARKITEKTUR BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: T2AN11 OBJECTIVES: To carry out a project within the subject field, either on your own or as a part of a group. This project may comprise design work, analyses, planning work, or similar. The project work intends to develop the students' abilities to use their acquired knowledge from the course critically. The work can be carried out in co-operation with companies, organisations or authorities. CONTENTS: Gathering and processing of data. Project planning. Carrying through the project. Writing reports. Reporting. LEARNING OUTCOMES: After completion of the course the student should: Be able to apply scientific methods and approaches to problem solving upon the implementation of a project task or study. Show the ability to critically apply the knowledge and skills that are expected during the education. Have deepened, broadened and further developed their knowledge within the main subject area of their education. Have developed their engineering mindset and be trained in independently solving problems. Show the ability to search, identify and analyse relevant information and knowledge. Show the ability to write a technically scientific report and to orally present its contents. Be able to shape and express knowledge through verbal communication, models, formulas and descriptive statistics. PREREQUISITES/QUALIFICATIONS: The Project Work may commence after approval from the head of department. General entry requirements and completed courses 90 credits in first cycle, corresponding to at least 60 credits within the major subject Structural Engineering (or the equivalent). TEACHING METHODS: The student will carry out, alone or in a group, a Project Work within the main subject area of their education. A supervisor and examiner will be appointed for every Project Work. The project will be carried out following the directives established at the School of Engineering. EXAMINATION AND GRADES: The course is examined through a written project report, an oral presentation of the project report, opposition by another group or student, and compulsory attendance at another group's or students oral presentation. The course is graded Fail (U), 3, 4 or 5. LITERATURE:

According to separate bibliography.

PROJECT WORK - STRUCTURAL ENGINEERING - 7.5 ECTS

PROJEKTARBETE BYGGNADSTEKNIK BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TP1N11 OBJECTIVES: To carry out a project within the subject field, either on your own or as a part of a group. This project may comprise design work, analyses, planning work, or similar. The project work intends to develop the students' abilities to use their acquired knowledge from the course critically. The work can be carried out in co-operation with companies, organisations or authorities. CONTENTS: Gathering and processing of data. Project planning. Carrying through the project. Writing reports. Reporting. LEARNING OUTCOMES: After completion of the course the student should: Be able to apply scientific methods and approaches to problem solving upon the implementation of a project task or study. Show the ability to critically apply the knowledge and skills that are expected during the education. Have deepened, broadened and further developed their knowledge within the main subject area of their education. Have developed their engineering mind-set and be trained in independently solving problems. Show the ability to search, identify and analyse relevant information and knowledge. Show the ability to write a technically scientific report and to orally present its contents. Be able to shape and express knowledge through verbal communication, models, formulas and descriptive statistics. PREREQUISITES/QUALIFICATIONS: The Project Work may commence after approval from the head of department. General entry requirements and completed courses 90 credits in first cycle, corresponding to at least 60 credits within the major subject Structural Engineering (or the equivalent). TEACHING METHODS: The student will carry out, alone or in a group, a Project Work within the main subject area of their education. A supervisor and examiner will be appointed for every Project Work. The project will be carried out following the directives established at the School of Engineering. EXAMINATION AND GRADES: The course is examined through a written project report, an oral presentation of the project report, opposition by another group or student, and compulsory attendance at another group's or students oral presentation. The course is graded Fail (U), 3, 4 or 5. LITERATURE: According to separate bibliography.

PROJECT WORK - STRUCTURAL ENGINEERING - 15 ECTS

PROJEKTARBETE BYGGNADSTEKNIK BSC CIVIL ENGINEERING

LEVEL: Bachelor (G). CODE: TP2N11 OBJECTIVES: To carry out a project within the subject field, either on your own or as a part of a group. This project may comprise design work, analyses, planning work, or similar. The project work intends to develop the students' abilities to use their acquired knowledge from the course critically. The work can be carried out in co-operation with companies, organisations or authorities. CONTENTS: Gathering and processing of data. Project planning. Carrying through the project. Writing reports. Reporting. LEARNING OUTCOMES: After completion of the course the student should: Be able to apply scientific methods and approaches to problem solving upon the implementation of a project task or study. Show the ability to critically apply the knowledge and skills that are expected during the education. Have deepened, broadened and further developed their knowledge within the main subject area of their education. Have developed their engineering mind-set and be trained in independently solving problems. Show the ability to search, identify and analyse relevant information and knowledge. Show the ability to write a technically scientific report and to orally present its contents. Be able to shape and express knowledge through verbal communication, models, formulas and descriptive statistics. PREREQUISITES/QUALIFICATIONS: The Project Work may commence after approval from the head of department. General entry requirements and completed courses 90 credits in first cycle, corresponding to at least 60 credits within the major subject Structural Engineering (or the equivalent). TEACHING METHODS: The student will carry out, alone or in a group, a Project Work within the main subject area of their education. A supervisor and examiner will be appointed for every Project Work. The project will be carried out following the directives established at the School of Engineering. EXAMINATION AND GRADES: The course is examined through a written project report, an oral presentation of the project report, opposition by another group or student, and compulsory attendance at another group's or students oral presentation. The course is graded Fail (U), 3, 4 or 5. LITERATURE: According to separate bibliography.

COMPUTER GRAPHIC MEDIA TECHNOLOGY - 7.5 ECTS

DATORGRAFIK BSC COMPUTER ENGINEERING

LEVEL: Bachelor (G). CODE: TDGC17. OBJECTIVES: The purpose of this course is to give knowledge and comprehension in the skill of artificial computer graphics. CONTENTS: Visualisation. Modelling and computer representation of 3D-models. Transformations. Texturing. Ray tracing techniques. Rendering. Animation and simulation. Anti-aliasing techniques. LEARNING OUTCOMES: After completion of the course the student should: Be able to independently model simpler scenes in a 3D-program. Be able to give an account of the most common computer representations of 3D-models. Be able to give an account of how transformations are implemented. Have awareness of the most common ray tracing methods. Be able to independently texture simpler models. Be able to give an account of the rendering process. Be able to independently create simpler animations and simulations in 3D-grafic art. Be able to give an account of the problems with, and solutions to, aliasing in images. PREREQUISITES/QUALIFICATIONS:Course in Linear Algebra, or equivalent. TEACHING METHODS: Teaching will be given in the form of lectures, laboratory exercises and group project work. EXAMINATION AND GRADES: Examination (4.5 credits), and Laboratory exercises and project work (3 credits). The grades used for the examination and the course as whole will be: Fail, 3, 4 and 5. The grades used for the laboratory exercises and project work will be either Pass or Fail. LITERATURE: According to separate bibliography.

RELATIONAL DATABASES - 7.5 ECTS

RELATIONSDATABASER BSC COMPUTER ENGINEERING

Course description can be found on our website www.jth.hj.se/eng

INFORMATION SECURITY - 7.5 ECTS

INFORMATIONSSÄKERHET BSC COMPUTER ENGINEERING

LEVEL: Bachelor (G). CODE: TIAA17. OBJECTIVES: The course aims at providing the student with theoretical and practical knowledge of information security as well as presenting a general overview of technical and organisational problems and solutions relevant to the subject area. CONTENTS: The course covers the following subjects: Basic security concepts (Confidentiality, Integrity, Availability). The security process; risk and threat evaluation, definition of security policies, specification and design of procedures, mechanisms, and appliances, implementation and Maintenance. Theory and technology relating to; authorisation, authentication (biometrics and certificates), access control, cryptography and crypto-analysis, malicious logic, network security (hardware (Firewalls, Wireless Networks etc), secure protocols), application and system security. LEARNING OUTCOMES: After completing the course the student shall: Have a general understanding of the subject and be able to explain common concepts important and relevant to it. The student shall furthermore have obtained knowledge about common threats and technical, practical, and organisational counter measurements used to safeguard IT-systems against such threats. Be able to critically evaluate and convey information and theory in order to solve. Specific security related problems of a technical or organisational nature. Be able to explain and communicate information security related knowledge in the English language in written as well as spoken form. PREREQUISITES/QUALIFICATIONS: None besides formal requirements for university studies but a general understanding of Discrete Mathematics, Computer Networks, and Computer Science is helpful. TEACHING METHODS: The course is divided into lectures, guest lectures, student presentations, and projects. All lectures and presentations are given in English. EXAMINATION AND GRADES: Examination (4.5 credits) and Project Report and Oral Presentation (3 credits). As grades on the exam and the completed course Failed, 3, 4, 5 and F, E, D, C, B, A is given (Swedish and ECTS system respectively). Projects will be performed, presented, and evaluated on project group basis. The project is graded Passed or Failed based on both presentations and reports. The grade Passed is required for getting final grades for the course. All examination is performed in English. LITERATURE: According to separate bibliography.

MOBILE APPLICATIONS - 7.5 ECTS

MOBILA TJÄNSTER BSC COMPUTER ENGINEERING

LEVEL: Bachelor (G). CODE: TMOB18. OBJECTIVES: After finishing this course the student will have knowledge in different techniques used for devoloping applications for mobile devices such as cellphones and PDA's. During the course the student will learn different techniques for mobile application development. Both client and server based development. The content in the course is concentrated to application development that takes adavantage of mobile devices ability to communicate and handle multimedia content. CONTENTS: The course contain the following parts: Different techniques in developing mobile applications. Mobile Web applications. Payment services. Application development aimed at mobile devices. LEARNING OUTCOMES: After the course the student will: Have knowledge to produce web pages aimed at mobile devices. Have knowledge about different payment methods for mobile devices. Be able to plan and build a website for mobile devices. Be able to develop applications that take advantage of mobile devices ability to show multimedia and communicate. PREREQUISITES/QUALIFICATIONS: Web programming. TEACHING METHODS: Lectures, laboratory work och project. EXAMINATION AND GRADES: Examination (3 credits) and Laboratory work and project (4.5 credits). LITERATURE: According to separate bibliography.

APPLICATIONS FOR MOBILE DEVICES - 7.5 ECTS

MOBILA APPLIKATIONER BSC COMPUTER ENGINEERING

LEVEL: Bachelor (G). CODE: TMOK12. OBJECTIVES: After finishing this course the student will have knowledge in one particular mobile operating system and the options for developing native applications on that platform. The course is heavily focused on programming. CONTENTS: The course contain the following parts: Development environment, language and library for a mobile device platform. User interface components. Graphics, animations and sound on the device. Network communication and data storage on the device. Other native APIs. Package and deliver the binary to the market. LEARNING OUTCOMES: After the course the student will: Have knowledge about what capabilities a native application might take advantage of on mobile devices. Have knowledge about hardware and sensors of mobile devices. Have knowledge about different mobile platforms. Be able to build a simple native application for a specific platform. Be able to enhance a native application with graphics, animations and sound. Be able to deliver a native application to a market. PREREQUISITES/QUALIFICATIONS: General entry requirements and completed course Mobile Applications (or the equivalent). TEACHING METHODS: Lectures, laboratories work and project. EXAMINATION AND GRADES: Examination (7.5 credits). LITERATURE: According to separate bibliography.

INTRODUCTION TO PROGRAMMING - 7.5 ECTS

INTRODUKTION I PROGRAMMERING BSC COMPUTER ENGINEERING

Course description can be found on our website www.jth.hj.se/eng

SYSTEMS ANALYSIS AND DESIGN WITH A CONCEPT OF QUALITY - 7.5 ECTS

INFORMATIONSSYSTEMS ANVÄNDBARHET BSC COMPUTER ENGINEERING

LEVEL: Bachelor (G). CODE: TIAC17. OBJECTIVES: The aim of the course is to provide the student with a comprehensive understanding of use qualities of interactive products. The student should understand how to design such products through collaboration, creativity, methods, and the use of design principles. The course aims at providing a contextual and cross-disciplinary view of the concept of design. The concepts of design and evaluation are closely related; both concepts are important in the course. CONTENTS: The course focuses, but is not limited to, the following concepts: Usability and other use qualities. Design principles for interactive products. Cognitive Psychology and Human Factors. Social aspects of collaboration. Interaction design methods. Requirements elicitation and specification through prototyping. User-Centered Design. Contextual Evaluation of IT. Web Science. LEARNING OUTCOMES: Knowledge and understanding; The student should be aware of the cross-disciplinary nature of interaction design, and the implications for design and evaluation projects. Skills and abilities; The student should be able to evaluate social consequences of poor design (e.g. low usability) of information technology. The student should be able to design an interactive product in accordance with contemporary theorie and methods on user-centered design. Assessment and attitude skills; The student should be able to independently and critically evaluate different qualities of interactive products in some social setting. PREREQUISITES/QUALIFICATIONS: Basics of systems development and databases. TEACHING METHODS: The course is based on lectures, seminars, and project work (performed in groups of 3-4 people). EXAMINATIONS AND GRADES: Examination and Project assignment (7.5 credits). LITERATURE: According to separate bibliography.

DIGITAL ELECTRONICS DESIGN - 7.5 ECTS

DIGITALDESIGN BSC ELECTRICAL ENGINEERING

LEVEL: Bachelor (G). CODE: TDDB18. OBJECTIVES: The objective of the course is to teach concepts related to design of digital systems. A hardware describing language, HDL, is used as a tool for designing. CONTENTS: The course includes the following areas: Hardware Describing Language VHDL. Combinational logic. Sequential logic. Finite State Machines (FSMs). Datapath components (e.g. adders, multipliers). Register Transfer Level design (RTL). Design verification (testbenches). Test of digital systems. Technologies (e.g. CPLD, FPGA, ASIC). LEARNING OUTCOMES: On completion of the course, the student should; Be able to model and simulate less complex digital circuits in VHDL. Be able to write testbenches in VHDL. Be able to describe the function of the most common datapath components and model the circuits in VHDL. Be able to use methodologies for RTL design, be able to discuss test methods for digital systems. Be able to describe different technologies for programmable logic. Be able to implement designs described in VHDL into programmable logic. PREREQUISITES/QUALIFICATIONS Courses in Programming methods 7.5 hp, Digital electronics 3.75 hp and Microcontrollers 7.5 hp or corresponding. TEACHING METHODS: Lectures and laboratory exercises/projects. EXAMINATION AND GRADES: Examination (5.5 credits) and lab/project assignments (2 credits). LITERATURE: According to separate bibliography.

REAL TIME OPERATING SYSTEMS - 7.5 ECTS

REALTIDSPROGRAMMERING BSC ELECTRICAL ENGINEERING

LEVEL: Bachelor (G). CODE: TROK10 OBJECTIVES: The course intends to give a basic knowledge of implications of having real-time constraints in applications, to give familiarity with real-time operating systems, to give ability to use established methods for scheduling analysis, and to give experience of scheduling analysis tools. CONTENTS: The course includes the following topics: Introduction to real-time systems. Concurrent programming. Scheduling of real-time tasks. Simulation tools for real-time systems. Programming languages for real-time systems. Real-time operating systems. LEARNING OUTCOMES: On completion of the course, the student should: Have acquaintance of and be able to give account for the characteristics of different types of real-time systems. Have acquaintance of and be able to give account for how operating systems are designed and works, especially regarding interrupts, processes, threads, and scheduling. Have acquaintance of and be able to give account for what characterizes a real-time operating system. Have acquaintance of and be able to give account for the proofs of the scheduling analysis tests that can be used for periodic processes with static and dynamic priorities. Have knowledge of and give details about different problems that can occur in inter-process communication, and how to avoid these problems. Independently be able to analyse various process scheduling problems by using different kinds of methods and tools. Have knowledge of and give details about different type of servers that can be used to handle aperiodic processes, combined with periodic processes. Have knowledge of and give details about how different factors like interrupts, jitter, and drift etc. affect a real-time system, and how these effects can be minimized. Have acquaintance of and be able to give account for what can be done to create reliable and fault-tolerant real-time systems. Be able to program real-time systems with scheduled communicating processes. Have acquaintance of and be able to give account for the special demands on programming languages suited to implement real-time applications. Have acquaintance of and be able to give account for some modern real-time operating systems. PREREQUISITES/QUALIFICATIONS: Programming methods 7.5 credits and Microcontrollers 7.5 credits or equivalent. TEACHING METHODS: Lectures, practical exercises, and projects. EXAMINATION AND GRADES: Examination (4.5 credits), and Laboratory work and project (3 credits).LITERATURE: According to separate bibliography.

PURCHASING AND SUPPLY CHAIN MANAGEMENT - 7.5 ECTS

INKÖP OCH AFFÄRSLOGISTIK BSC INDUSTRIAL ENGINEERING AND MANAGEMENT

LEVEL: Bachelor (G). CODE: TIAC18. OBJECTIVES: The objective of the course is to provide deeper knowledge in logistics from a purchasing and business relations perspective. The focus is on the influence of purchasing on the company's result. CONTENTS: The course includes the following topics: Purchasing and strategic purchasing. Define requirement, document,

negotiate, close a deal. TCO, Total Cost of Ownership. Negotiation. Supplier evaluation. Legal aspects, contract. Terms of payment– (tied up capital). Incoterms. Customer and supplier relations (CRM/SRM). Customer value (CVM). Relations, cultural, organisational differences. SCM, supply networks. LEARNING OUTCOMES: On completion of the course, the student should: Have knowledge about the influence of purchasing on the company's result and how the purchaser can contribute to the result. Understand the goals of purchasing and the conflicts between these goals and other goals that the company has. Understand the importance of a holistic view on purchasing,TCO. Be able to strategically evaluate and choose the best supplier and the best type of relation. Be able to negotiate in a purchasing situation. Be able to describe incoterms. Understand the principles for international and global purchase. Have knowledge about how SRM/CRM systems work. Understand the importance of paying attention to both customer and supplier relations and have knowledge about different way of doing this. Understand the importance of involving production and product development in the purchasing process. PREREQUISITES/QUALIFICATIONS: Fundamental logistics and distribution. TEACHING METHODS: Lectures, exercises, and projects. EXAMINATION AND GRADES: Examination, (7.5 credits). LITERATURE: According to separate bibliography.

WORK-HUMAN-TECHNOLOGY - 7.5 ECTS

ARBETE-MÄNNISKA-TEKNIK BSC INDUSTRIAL ENGINEERING AND MANAGEMENT

LEVEL: Bachelor (G). CODE: TAMB17. OBJECTIVES: To give students a deeper understanding of the human at work and the interaction with the surrounding technology and organization in an industrial context. The course further aims at providing insights into the strengths and limitations of the human at work and how products and industrial systems can be designed to result in high efficiency and sustainable production. CONTENTS: The course includes the following topics: The preconditions of the human at work and work design: physical workload, physical work environment, cognition, stress and shift work. Sociotechnical systems: theoretical base, system models and applications. The Swedish work environment act and the structure of the work environment regulation. Work place design and the influence of complexity. Design of the human – technology system interface. LEARNING OUTCOMES: After completed course the student is supposed to: Have knowledge about different views of the human at work. Be able to describe in detail how different aspects of work affects each other in a system perspective. Know about and be able to use system models to examine and analyze work and work places with regard to efficiency and sustainability. Have knowledge about and be able to make judgments concerning the design of work and the different human preconditions regarding physical work load (walk, lift, carry, handle…) and physical aspects in the work environment like sound, light, space etc. Have knowledge about and be able to make judgments of work design with respect to the human capabilities of information processing and decision making (cognitive aspects). Have knowledge about and be able to make judgments of work design with respect to psychic and social aspects of work, for example stress, shift work, the influence of repetitive work and isolated work. Have knowledge about the legislation concerning work environment, its application and consequences for industrial business. Be able to apply the content of the course in a reflective manner and with a holistic view in the project work at a real workplace. Be able to make a system view workplace analysis comprised of studies of theoretical prerequisites, method choice, realization and report. PREREQUISITES/QUALIFICATIONS: Knowledge corresponding to the course Systems and Process Analysis 7.5 credits or equivalent. TEACHING METHODS: Lectures, mandatory seminars, laboratory lessons and supervision of project work. EXAMINATION AND GRADES: Oral exam (3 credits), project work (3 credits), laboratory lessons and seminars (1.5 credits). The ECTS-grading of the entire course is based on the result of the oral exam and project work. For laboratory lessons and seminars passed or not passed are used. LITERATURE: According to a separate bibliography.

CAD - BASIC SOLID MODELLING 7.5 ECTS

CAD - GRUNDLÄGGANDE SOLIDMODELLEING BSC MECHANICAL ENGINEERING

Level: Bachelor (G). CODE: TCSA17. OBJECTIVES: The aim of the course is to give basic knowledge about concepts, methods, and how to make use of solid modelling tools to in the product development process. Practical modelling using Pro/Engineer 4.0 (or equal) is a priority in the course. CONTENTS: Geometrical representations. Neutral file formats. Concepts and methods used to define solid models. Defining assemblies of solid models. Production drawings. Presentation material. Mechanisms. Project. LEARNING OUTCOMES: After accomplished course the student should: Have knowledge. Have knowledge about and be able to outline different methods to represent geometry. Be able to build parts and assemblies using a solid modeling software. Be able to create drawings from solid models. Be able to communicate geometrical information using neutral file formats. Be able to describe and present different designs represented in a CAD system. PREREQUISITES/QUALIFICATIONS: General entry requirements. TEACHING METHODS: Lectures, exercises and hands-on software training. Assignments and projects. Self study and information search can be included. The course language is English. EXAMINATION AND GRADES: Examination (2 credits), Project (3 credits) and Hand-in-exercises (2.5 credits). The project presentation and the examination is used to set the final grade. LITERATURE: According to separate bibliography.

MECHATRONICS M- 7.5 ECTS

MEKATRONIK M BSC MECHANICAL ENGINEERING

LEVEL: Bachelor (G). CODE: TMMB19. OBJECTIVES: Provides basic knowledge about components used in mechanical systems controlled by microcontrollers, or other computer based control systems. Sensors, actuators and controllers will be dealt with. The course is cross-disciplinary. Its main focus lies on electronics and controllers, but with the aim to interface with the student's disciplinary area. CONTENTS: The course includes the following topics: Electrical Components used in Mechanical systems and products. Operational Amplifiers. Power Electronics. Small Motors. Sensors and Transducers for Use in Mechanical Control Systems- Basically Motion Measurement. Micro Controllers. Control Systems in Automation and Robotics. Embedded Control Systems. LEARNING OUTCOMES: On completion of the course, the student should: Be familiar with sensors

and transducers used in Electro-Mechanical Control Systems. Be familiar with interfacing between mechanical and electrical systems. Be familiar with micro controllers and PLC:s. Be able to collaborate cross-disciplinary. Be able to build a mechatronical system, and make it work. PREREQUISITES/QUALIFICATIONS: Basic course in physics and measurement technology. Fundamentals in one of the disciplines Mechanical, Electrical or Computer Engineering. TEACHING METHODS: Lectures and laboratory work. Project work. EXAMINATION AND GRADES: Project work (7.5 credits). LITERATURE: According to separate bibliography.

SIMULATION OF RIGID BODY SYSTEMS - 7.5 ECTS

SIMULERING AV STELKROPPSSYSTEM BSC MECHANICAL ENGINEERING

LEVEL: Bachelor (G). CODE: TSSC18. CONTENTS: The objective of the course is to provide knowledge in rigid body dynamics and the numerical treatment of rigid body systems.The course includes the following topics: Dynamics of particles - repetition, Planar kinematics of rigid bodies, Coriolis' rule of derivation, relative motion of two points, kinematic, constraints, instant center of velocities, Planar kinetics of rigid bodies, equations of motion, linear and angular momentum, mass moment of inertia, Power, balance in energy, kinetic energy, linear and angular momentum, impact, Rigid body dynamics in three-dimension, inertia tensor, parallel-plane motion, gyroscopic motion, Numerical treatment of rigid body systems by using a commercial system. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme. TEACHING METHODS: Lectures, exercises and computer exercises. EXAMINATION AND GRADES: Examination 4.5 (credits), Project work 3 (credits). The course is graded Fail (U), 3, 4 or 5. LITERATURE: According to a separate bibliography.

MATERIAL TESTING AND CHARACTERIZATION - 7.5 ECTS

MATERIALPROVNING BSC MECHANICAL ENGINEERING

LEVEL: Bachelor (G). CODE: TMPK11. OBJECTIVES: The course objective is to provide basic knowledge about experimental techniques to use for characterizing of structure, mechanical and physical properties of metallic materials. CONTENTS: The course includes the following topics: Tensile testing, sample preparation, standards; Hardness tests; Fatigue and fracture toughess testing; Creep of metals; Techniques for measurements of thermal diffusivity, thermal conductivity, thermal expansion and specific heat; Gas analysis and chemical analysis; Optical and scanning electron microscopy. LEARNING OUTCOMES: On completion of the course, the student should: Have the knowledge to choose and perform suitable testing methods. Have the ability to explain different types of mechanical testing and analysis methods. Have the knowledge and ability to use different equipment for measurements of physical properties. Have the knowledge and ability to use equipment for determining chemical compostion. Be able to explain the functionality of and possibilities with optical and scanning electron microscopy. PREREQUISITES/QUALIFICATIONS: General entry requirements and completed course Engineering Materials 7,5 credits, Manufacturing Technology 7,5 credits and Material and Failure Analysis 7,5 credits (or the equivalent). TEACHING METHODS: Lectures and laboratory exercises. EXAMINATION AND GRADES: Examination (4 credits), labratory work (3.5 credits). LITERATURE: According to seperate bibliography.

COMPONENT CASTING 7.5 ECTS

KOMPONENTGJUTNING BSC MECHANICAL ENGINEERING

Level: Bachelor (G). CODE: TKGK12. OBJECTIVES: The purpose of the course it to give the student sufficient skills and understanding of engineering design, material properties and manufacturing of casting components. CONTENTS: The course contains the following parts: Freedom of design in casting manufacturing, examples of what can be made by casting processes. Overview of resource efficient casting manufacturing methods of components. Pattern technology and prototypes. Mould and core materials, properties of core materials. Permanent mould materials, Sand and ceramic materials. Cast materials, phase diagrams, solidification and microstructure development and mechanical properties of alloys. Defect formation. Shrinkage and porosity formation. Calculation of solidification, mould filling and feeding etc. Modeling and simulation of the casting material and process. Stress and warping of castings. Integration of CAD/CAM and simulation in design of castings. Design of castings and material selection. Quality control. LEARNING OUTCOMES: On completion of the course, the student should: Understand the specialty of casting processes and development of properties to be able to make optimal selection of alloy, design and casting process for advanced and high performing casting components. Able to investigate a metallic material in different perspective and able to discuss with a material expert, different ways of development and alloy selection. PREREQUISITES/QUALIFICATIONS: Basic course in Material Science and in Manufacturing methods, or similar type of knowledge (or the equivalent). TEACHING METHODS: Lectures. Laborations and industrial workshops. EXAMINATION AND GRADES: Examination (5 credits), Laboration and Assignments (2,5 credits). The course is graded Fail (U), 3, 4 or 5. LITERATURE: According to separate bibliography.

MATERIAL AND FAILURE ANALYSIS - 7.5 ECTS

MATERIAL OCH HAVERIANALYS BSC MECHANICAL ENGINEERING

LEVEL: Bachelor (G). CODE: TMHK12. OBJECTIVES: The course will introduce advanced and detailed knowledge of deformation, fracture and failure mechanisms in metallic materials at both room and elevated temperature. Emphasis is placed on the use of materials, i.e. the properties of materials when subjected to cracking, fatigue, stress at high temperature etc, or different kinds of life/use limiting conditions. CONTENTS: The course covers the following topics: Analytical methods/techniques for the study of fracture surfaces. Deformation, crack initiation and growth. Fracture and failure mechanisms that occur in metallic materials. Life or usage limiting environments. LEARNING OUTCOMES: On completion of the course, the student should

have understanding and able to explain the different types of failures and their mechanisms, have understanding and able to describe the causes of failures from materials science point of view, be able to use appropriate analysis methods, have knowledge about the different environmental impacts on the deformation and crack initiation and growth. PREREQUISITES/QUALIFICATIONS: General entry requirements and completed courses Engineering Materials 7,5 credits and Manufacturing Technology 7,5 credits (or the equivalent). TEACHING METHODS: Lectures and exercises and laboratory work. EXAMINATION AND GRADES: Examination (5 credits), labratory work (2.5 credits). LITERATURE: According to seperate bibliography.

INTERCULTURAL AND INTERNATIONAL COMMUNICATION - 7.5 ECTS

INTERKULTERELL OCH INTERNATIONELL KOMMUNIKATION

LEVEL: Bachelor (G). CODE: TIKA17. OBJECTIVES: This course is designed for students/professionals wishing to increase their intercultural understanding and to gain the tools for building international ties. Students will explore their own culture, begin to perceive the impact of culture on daily life, learn some of the basic theories of cross-cultural communication and work towards achieving cross-cultural competence. CONTENTS: Focus is placed on the application of theory and research in intercultural communication. Both cross-cultural (comparisons of communication across cultures) and intercultural (communication between members of different cultures) communication are emphasized. Topics include: Swedish culture, comparison of cultures. Worldview, ethnocentrism, non-verbal communication. Cultural values and identity, the deep structures of culture. Multiculturalism and Cultural Change. Immigration, integration and cross-cultural work. LEARNING OUTCOMES: On completion of the course, the student should be able to: Define and recognize cultural factors that affect the communication process. Show understanding of the sociological and psychological signs a person goes through during the adaptation to a new culture. Reflect over the process of becoming interculturally competent. Develop skills in effectively functioning in a cross-cultural environment. PREREQUISITES/QUALIFICATIONS: General admission requirements and English B. TEACHING METHODS: Lectures, structured discussions in multi-culture groups with written and oral reports, seminars around written assignments. Guest lectures. EXAMINATION AND GRADES: Examination 7.5 hp. Two written assignments. Active attendance at lectures, work-shops and seminar. LITERATURE: According to separate bibliography.

MATHEMATICAL STATISTICS - 7.5 ECTS

MATEMATISK STATISTIK

LEVEL: Bachelor (G). CODE: TMSB17. OBJECTIVES: The course aims at giving basic knowledge of probability theory and statistical inference methods and their applications, with focus on the analysis of sets of data. CONTENTS: The course includes the following topics: Basic probability theory. Random variables. Discrete and continuous distributions, especially the normal distribution. The central limit theorem with applications. Descriptive statistics. Point estimates. Interval estimates. Test of hypothesis. Nonparametric statistics. Statistical quality control. LEARNING OUTCOMES: On completion of the course, the student should: Be able to perform basic probability calculations. Be very familiar with the notions of a random variable, its mean and variance and also be able to specify some typical distributions and their applications. Have a good understanding of the normal distribution and also be able to apply the central limit theorem. Have an understanding for the effect of variability in different circumstances. Be able to compute different kinds of numerical measures for a data set. Be able to use different methods of estimating a relevant parameter and also be able to compare the efficiency of different methods. Have an understanding for the uncertainty involved in connection with parameter estimation and should also be able to quantify and compute this uncertainty. Be able to use different kinds of hypothesis tests. Have an understanding for the risks involved in making a decision based on a hypothesis test. Have a knowledge of how to use statistical methods for quality control (SPC). PREREQUISITES/QUALIFICATIONS: The course Calculus 7.5 hp or equivalent. TEACHING METHODS: Lectures and seminars. EXAMINATION AND GRADES: Examination (7.5 credits). LITERATURE: According to separate bibliography.

PHYSICS AND SIMULATIONS - 7.5 ECTS

FYSIK OCH SIMULERING

Level: Bachelor (G). CODE: TFSK12. OBJECTIVES: The course aims to provide students with knowledge of classical physics and its engineering applications, and to introduce the software Simulink and MatLab as tools for problem solving. CONTENTS: The course covers the following topics: Classical physics with emphasis on mechanics, thermodynamics and waves, Technical applications related to classical physics, Problem solving with simulation software Simulink and MatLab. LEARNING OUTCOMES: After completing the course, students should: have an understanding of the relevance of physics in technology, be able to use their knowledge to solve problems in classical physics with applications, have basic skills in using Simulink and MatLab. PREREQUISITES/QUALIFICATIONS: High school physics or equivalent knowledge, Linear algebra 7,5 hp and Mathematical analysis 7,5 hp or equivalent knowledge. TEACHING METHODS: Lectures, tutorials and computer labs. Teaching will, if demanded, be in English. EXAMINATION AND GRADES: The course is graded Fail (U), 3, 4 or 5. For grade higher than 3: the student have to do a written exam related to the theory. Examination (7.5 credits). LITERATURE: According to a separate list. Other educational resources: Simulink and MatLab.

RESEARCH AND INQUIRY METHODOLOGY - 7.5 ECTS

FORSKINGS- OCH UTREDNINGSMETODIK

LEVEL: Master (A). CODE: TFUD27. OBJECTIVES: The course intends to improve the knowledge and ability among the participants to systematically collect, treat, analyse, and present different kinds of data required for research and inquiry projects,

and to critically review the result of such work. CONTENTS: The course includes the following areas: Basics in theory of science and knowledge. Research methodology. Techniques for data collection. Data analysis. Presentation of results. Critical review of scientific work. LEARNING OUTCOMES: On completion of the course, the student should: Have acquaintance of and be able to give account for the main traditional directions within theory of science. Have knowledge of and give details about different research methodologies and techniques for data collection. Have comprehension of and be able to give account for aspects affecting the choice of research methodologies. Have knowledge of and be able to give details about different ways of treating collected data. Independently be able to plan research and inquiry work. Independently be able to carry out critical review of scientific work. Independently be able to search and find published scientific work through appropriate sources. Show good ability to carry out and present, in writing and orally, assigned tasks. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the master program (or the equivalent). TEACHING METHODS: Lectures and exercises. EXAMINATION AND GRADES: Examination (4.5 credits) and examination (3 credits). LITERATURE: According to separate bibliography.

SWEDISH LANGUAGE, CULTURE AND SOCIETY 1 - 7.5 ECTS

SVENSKT SPRÅK, KULTUR OCH SAMHÄLLE

LEVEL: Bachelor (G). CODE: LS1F11. OBJECTIVES: The course will give the students a basic knowledge of Swedish language, culture and society. It consists of two parts: lessons of the Swedish language and lectures (in English) on Swedish culture and society. CONTENTS: Basic Swedish grammar. Swedish pronunciation and prosody. Text reading. Listening comprehension. Written exercises. Oral exercises and structured conversation. Lectures (in English) on Swedish society and culture. LEARNING OUTCOMES: A basic knowledge of Swedish grammar, vocabulary and commonday phrases. Sufficient language skills and general “know-how” to understand and make themselves understood in situations occurring in daily life in Sweden. A basic knowledge of Swedish society and culture. PREREQUISITES/QUALIFICATIONS: Competency in Swedish language is not required. Fluency in English equivalent to at least 550 (old scale)/312 (new scale) TOEFL score is required since part of the teaching is in English. TEACHING METHODS: Lessons of Swedsih language. Lectures held by different experts of the topics. Active participation required. EXAMINATION AND GRADES: Written individual examination at the end of the course of both parts of the course. Compulsory attendance. VG, G and U and ECTS-grades A,B, C, D, E, and FX are given. LITERATURE: According to separate bibliography.

SWEDISH LANGUAGE, CULTURE AND SOCIETY 2 - 7.5 ECTS

SVENSKT SPRÅK, KULTUR OCH SAMHÄLLE

LEVEL: Bachelor (G). CODE: LS2F11. OBJECTIVES: The course will give the students an increased knowledge of Swedish language and culture and train them to use the language in oral and written communication. CONTENTS: Basic Swedish grammar. Swedish pronunciation and prosody. Text reading. Listening comprehension. Written and oral exercises. Structured conversations and discussions. LEARNING OUTCOMES: Improved knowledge of Swedish language and culture. Better skills to speak and write Swedish. Inspire the students to get in contact with Swedish daily life and culture. PREREQUISITES/QUALIFICATIONS: Pass of the course Swedish Language, Culture and Society 1. TEACHING METHODS: Lectures, class activities, some student-directed. Active participation required. EXAMINATION AND GRADES: Written and oral individual examination at the end of the course. VG, G and U and ECTS-grades A,B, C, D, E, and FX are given. LITERATURE: According to separate bibliography.

TECHNICAL ENGLISH - 7.5 ECTS

TEKNISK ENGELSKA

LEVEL: Bachelor (G). CODE: TENA17. OBJECTIVES: To give students oral and written English proficiency of value to engineers at work and in contacts with English speakers. CONTENTS: Written proficiency designed to provide the engineer or scientist with guidelines for engineering writing and scientific writing in order to be able to communicate their technical work. Grammar focus to help students master various mechanical and stylistic aspects of engineering writing and scientific writing. Oral proficiency to develop fluency and confidence in delivering presentations to technical and non-technical audiences. Text Study to aid comprehension and develop vocabulary. LEARNING OUTCOMES: Having completed this course of study students will be able to demonstrate: Knowledge and understanding: Fluency and accuracy in speaking and writing. Ability to produce effective written documents appropriate to the audience and purpose. Ability to deliver effective oral presentations using a variety of techniques. Practical skills: Use of appropriate vocabulary and terminology for technical and non-technical audiences. Preparation and planning and delivery of an oral presentation. Evaluation of peer presentations. Application of conventions in technical and non-technical writing, such as the format, layout and typography of a document. Planning, structuring and writing objective and persuasive documents appropriate to the audience in mind. Identification and correction of mechanical errors in writing (grammar, punctuation, spelling) and style. Assessment and attitude skills: The entire focus of this course of study is to develop language and communication skills that can be applied to other areas of study and future working lives. Language skills - to further develop range, register and appropriacy. Communication skills - to develop spoken and written presentation skills appropriate in technical and non-technical contexts. PREREQUITIES/QUALIFICATIONS: General admission requirements and a good command of the English language. TEACHING METHODS: Lectures, seminars, class activities, some student-directed. Attendance is mandatory. EXAMINATION AND GRADES: Examination and oral reports (7.5 credits). LITERATURE: According to separate bibliography.

FINAL PROJECT WORK, BACHELOR - 15 ECTS

EXAMENSARBETE BACHELOR OF SCIENCE

LEVEL: Bachelor (G). CODE: to be set. OBJECTIVES: To carry out a project within the subject field, either on your own or as a part of a group. This project may comprise design work, analyses, planning work, projection work or similar. The project work intends to develop the students' abilities to use their acquired knowledge from the course critically. The work is preferably carried out in close co-operation with companies, organisations or authorities. CONTENTS: Gathering and processing of data. Project planning. Carrying through the project. Writing reports. Reporting. LEARNING OUTCOMES: After completion of the course the student should: Be able to apply scientific methods and approaches to problem solving upon the implementation of a project task or study. Show the ability to critically apply the knowledge and skills that are expected during the education. Have deepened, broadened and further developed their knowledge within the main subject area of their education. Have developed their engineering mind-set and be trained in independently solving problems. Show the ability to search, identify and analyse relevant information and knowledge. Show the ability to write a technically scientific report and to orally present its contents. Be able to shape and express knowledge through verbal communication, models, formulas and descriptive statistics. PREREQUISITES/ QUALIFICATIONS: The Final Project Work may commence after approval from the head of department. A minimum of 105 ECTS credit points and all G1 and G2 courses within the main subject area should be approved. TEACHING METHODS: The student will carry out, alone or in a group, a Final Project Work within the main subject area of their education. A supervisor and examiner will be appointed for every Final Project Work. The project will be carried out following the directives established at the School of Engineering. EXAMINATION AND GRADES: The course is examined through a written project report, an oral presentation of the project report, opposition by another group, and compulsory attendance at another group's oral presentation. The grades that will be used will be either pass or fail and ECTS-grades. LITERATURE: According to separate bibliography.

COURSE DESCRIPTIONS FOR COURSES PROVIDED IN ENGLISH:

MASTER OF SCIENCE

BUSINESS INTELLIGENCE - 7.5 ECTS

MSC INFORMATICS

LEVEL: Bachelor (G). CODE: JBBC18. OBJECTIVES: This course aims at giving the student an understanding of the basics of business intelligence, from both a technical and a person/organization perspective and ways of finding business advantages. The student will have both a theoretical knowledge of relevant concepts of the area, as well as a more practically oriented view of possible tools and experiences of their use. CONTENTS: The focus in this course is different kind of needs enterprises have for information, especially information from outside of the enterprise. The course will go into main areas of BI data warehousing, business analytics, and performance and strategy. There is both a technical view of the subject, and also a person/organization view. Some concepts the course will touch upon are: Information storing and retrieval. Semantics and ontologies. Handling unformatted information. Handling information with many different formats. Information logistics. Interpreting information and learning. LEARNING OUTCOMES: Knowledge and understanding: The student will have a basic understanding of the concept of business intelligence from both a technical and a person/organization perspective. The student will have an understanding of the role of business intelligence to gain business advantages. Skills and abilities: The student should be able to identify areas of business relevance for business intelligence. Assessment and attitude skills: Assessment and attitude skills: The student should be able to understand and assess some business intelligence concepts and their business relevance. Assessment capabilities. The student should be able to identify elements containing both information needs, mediating technologies, and their interplay for organizations in general, and to have an increased understanding of the business value of business intelligence. PREREQUISITES/ QUALIFICATIONS: Basic course in: business fundamentals, databases and information systems. TEACHING METHODS: Lectures, seminars and assignments. EXAMINATION AND GRADES: Examination and reports (7.5 credits). LITERATURE: According to separate bibliography.

DATABASE SYSTEMS AND TRENDS - 7 ECTS

DATABASSSYSTEM OCH TRENDER MSC INFORMATICS

LEVEL: Master (A). CODE: TDTD28. OBJECTIVES: The aim of the course is to provide students with a thorough understanding of the concepts of the relational database model, its possibilities and limitations. It will also give insight to other kinds of database systems such as object oriented databases, data warehouses and distributed database systems. CONTENTS: The course includes the following topics: Indexes and Storage Structures. Relational Languages and the Relational Model. Query Optimisation. Normalisation algorithms for the synthesis of database schema. Object-Oriented Databases. Data Warehouses. Distributed Database Systems. LEARNING OUTCOMES: On completion of the course, the student should; Be able to describe, analyse storage- and index structures and do calculations that determine the efficiency of these. Have knowledge about the relational languages tuple calculus and relational algebra and of their connection to the relational model and their usefulness as query languages. Be able to describe how the query optimiser works, and also be able to utilise methods for query optimisation and estimation of resources. Have knowledge about a normalisation algorithm for synthesising a relational database schema and have knowledge about some fundamental theoretical concepts that supports these kinds of algorithms. The student should also be able to implement the algorithm in some programming language, of his/her choice. Have an understanding of how object oriented database systems manages complex data types consistent with the modelling languages, storage structures and query languages used and query optimisation. Have knowledge about the Data Warehouse for decision support and also know about its

architecture, how its schema is modelled and the ETL-process for cleaning and converting data. The student should also be able to implement a small example. Have an understanding of how distributed database systems can be built and be able to describe how query optimisation and transaction management works in this context. PREREQUISITES/QUALIFICATIONS: Basic knowledge of modelling and management of relational database systems (ground level course in database management or equivalent). Basic knowledge about programming in some object oriented language is recommended. TEACHING METHODS: The education is given in the form of lectures, exercise events, laboratory assignments and project assignments. There will also be approximately 60 exercises to be solved in group work. Ordinary lectures and exercise events will cover most of the theory necessary for the exercises given as homework. Homework exercises can be discussed within groups (2 to 4 persons), but shall be presented individually. For each topic covered in the course there will be an occasion for assessment of homework exercises. EXAMINATION AND GRADES: Examination (4 credits) and Laboratory- and projectwork (3.5 credits). The course uses ECTS grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Fail for Swedish students. Laboratory- and projectwork: Pass or Fail. LITERATURE: According to separate bibliography.

DEVELOPMENT OF DISTRIBUTED APPLICATIONS - 7 ECTS

UTVECKLING AV DISTRIBUERADE APPLIKATIONER MSC INFORMATICS

LEVEL: Master (A). CODE: TUDD27. OBJECTIVES: The objective is to introduce "State-of-the-Art" in the development of distributed applications. This includes fundamentals of distributed systems, middleware and integration approaches, and technologies and tools in this context. CONTENTS: The course includes the following topics: Fundamentals of Distributed Systems. Layered Software Architectures. Contemporary Middleware Models and Approaches. Middleware Technologies (CORBA, Java EE, .NET). Integration Technologies (XML Web services). LEARNING OUTCOMES: After completion of this course, students shall: Have knowledge of fundamentals of distributed systems. Be able to explain different middleware approaches. Have understanding of integration technologies. Be able to choose an appropriate middleware or integration technology to develop a particular distributed application. Be able to develop distributed applications using different contemporary technologies. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. Courses/experience in programming, in particular Web programming. Completed courses in OOA/OOD and Operating systems or equivalent. TEACHING METHODS: Lectures, laboratory work and project work. EXAMINATION AND GRADES: Examination (3.5 credits), and Laboratory and project work (3.5 credits). The course uses ECTS grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Fail for Swedish students. Laboratory and project work: Pass or Fail. LITERATURE: According to separate bibliography.

DEVELOPING ELECTRONIC COMMERCE CAPABILITIES- 7.5 ECTS

MSC INFORMATICS

LEVEL: Bachelor (G). CODE: JDEC17. CONTENTS: Marketing covers electronic commerce on business-to-business and business-to-consumer markets by discussing new aspects of marketing and Internet business models. The legal part considers the main areas of law related to electronic commerce including contracts, consumer protection, jurisdiction in connection with conflicts, intellectual property rights, and taxation related to electronic commerce. A part of the course focuses on informatics and covers electronic commerce infrastructure, the principles for electronic payments, interface design and the consequences of electronic commerce on business communication, and interaction within business systems. LEARNING OUTCOMES: On completion of the course the students will be able to: Define and describe basic concepts and relationships in business-to-business and business-to-consumer markets as well as major themes and new aspects of marketing and Internet business models. Explain and discuss business, technical and legal issues in relation to electronic commerce. Search for and organise relevant theories concerning electronic commerce and use this information to analyse electronic commerce applications from legal, marketing and informatics perspectives and anticipate challenges associated with electronic commerce solutions. Identify relevant legal, marketing and design issues in cross-border electronic transactions and researching their implications. Identify, articulate and communicate, both individually and in groups, typical tasks and legal, marketing and design issues in cross-border electronic transactions relating to electronic commerce and research their implications orally and in writing. Synthesise prior theoretical and experiential knowledge in law, marketing and informatics and apply this information to evaluate electronic commerce applications. Reflect upon and evaluate others and own work during assignments. PREREQUISITES/QUALIFICATIONS: Informatics 60 credits (or the equivalent). TEACHING METHODS: Lectures, individual and group assignments, tutoring. Some parts of the course may be given online by using e.g. web-based learning platforms. EXAMINATION AND GRADES: The course is graded Fail (U), Pass (G) or Pass with Distinction (VG). 40% of the course grade is determined from written and presented reports, and 60% from a written exam . The grade from the written exam determines the course grade under the assumption that all parts, i.e. written and presented reports, are completed. ILO 1, 2, 6 are examined in the written exam. ILO 3-7 are examined in individual and group assignments. The grade is translated to the ECTS grading scale (A, B, C, D, E, Fx or F). Examination (4.5 credits). Assingments (3 credits). LITERATURE: According to seperate bibliography.

ENTERPRENEURIAL PERFORMANCE MANAGEMENT AND IT - 7.5 ECTS

MSC INFORMATICS

LEVEL: Master (A). CODE: JEIR21. OBEJCTIVES: The course has a focus on information systems in support of entrepreneurial initiatives and innovations management. CONTENTS: Performance management solutions - themes, concepts and challenging issues. Performance management in an information provision perspective. Performance management solutions - extensions and deployment. Performance management and information provision solutions evaluation and impact on organizations. Performance management in relation to entrepreneurial innovations and initiatives in various enterprises. LEARNING OUTCOMES: On completion of the course the students will be able to: Define and describe basic concepts and relationships in entrepreneurial

performance management and information provision for performance management and measurement for follow-ups of entrepreneurial innovations and initiatives in various enterprises - as well as new aspects and major themes underlying the study of IT-based performance management. Explain and discuss business and technical issues in relation to information provision for performance management and measurement for follow-ups of entrepreneurial innovations and initiatives in various enterprises. Understand the role of IT and IS in performance management in a business context, with a focus on information systems in control and measurement of innovations and methods. Search for and organise relevant theories concerning performance management and information provision for performance management and measurement for follow-ups of entrepreneurial innovations and initiatives in various enterprises. Articulate and communicate, both individually and in groups, the methods and processes of IT in performance management. Demonstrate intellectual skills needed to elaborate on performance management and information provision for performance management and measurement in various enterprises and in a business context. Synthesise prior theoretical and experiential knowledge in IS and performance management and development with current literature on information provision and apply this information to assess the use of performance management in information provision projects for performance management and measurement for follow-ups of entrepreneurial innovations and initiatives in various enterprises. Reason about, assess, and reflect upon and evaluate their own and the work of others during assignments together with various qualities related to performance management and information provision. PREREQUISITES/QUALIFICATIONS: Bachelor degree 180 credits in Informatics, Business Administration, Information Technology (or the equivalent). TEACHING METHODS: Lectures, individual and group assignments, laboratory work, tutoring. EXAMINATION AND GRADES: The course is graded Fail (U), Pass (G) or Pass with Distinction (VG). 60% of the course grade is determined from written and presented reports, and 40% from seminar reports and presentations. The grade from the written reports and presentations determines the course grade under the assumption that all parts, i.e. written and presented seminar reports, are completed. ILO 1, 2, 3 will be examined in seminar reports, ILO 4 – 8 will be examined in assignment reports and presentations. The grade is translated to the ECTS grading scale (A, B, C, D, E, Fx or F). Examination (7.5 credits). LITERATURE: According to seperate bibliography.

ENTERPRISE MODELLING - 7.5 ECTS

VERKSAMHETSMODELLERING MSC INFORMATICS

LEVEL: Master (A). CODE: TVMD28. OBJECTIVES: The course objective is to give students' the knowledge and skills of constructing and analyzing conceptual models addressing various organizational design problems from different modeling perspectives. Examples of such perspectives are goals, processes, concepts, information system requirements. CONTENTS: The course addresses the following topics: Organisations and information systems, information system requirements engineering. Change management and reengineering. Enterprise Modeling methods, languages and modeling processes. Enterprise Knowledge Development (EKD) method, and The EKD modeling language and the participative modeling process. Quality issues of Enterprise Models. Other Enterprise Modeling approaches and languages (e.g. business use cases, EPC). Enterprise Modeling tools (e.g. METIS) and the use of simple drawing tools to support modeling (e.g. Visio). Enterprise Modeling and information system development, requirements engineering, agile development. Reuse of knowledge captured in Enterprise Models. Organizational patterns, task patterns and pattern creation process. State of the art research direction in Enterprise Modeling. LEARNING OUTCOMES: After successful completion of the course the students will: Have the knowledge of how to use Enterprise Modeling for various problem situations e.g. organisational development, information system development, business process standardisation, quality assurance, organisational learning, as well as sharing best practices. Be able to construct enterprise models using the EKD method. Be able to understand enterprise models documented according to other Enterprise Modeling languages and have the pre-existing knowledge to learn those languages. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. TEACHING METHODS: The course will consist of lectures, practical hands-on modelling seminars in groups, and review seminars of the group assignment. EXAMINATION AND GRADES: Examination (3.5 credits) and Group assignment (3.5 credits). The course uses ECTS grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Fail for Swedish students. Group assignment grades are Pass or Fail. LITERATURE: According to separate bibliography.

ENTERPRISE SYSTEMS - 7.5 ECTS

VERKSAMHETSSYSTEM MSC INFORMATICS

LEVEL: Bachelor (G). CODE: JERC18. OBJECTIVES: This course provides the students with an overview of the Enterprise Systems in a business context, from an informatics perspective. The main objective is to provide the students with basic concepts and terminology in the domain of Enterprise Systems and its potential impact on business. CONTENTS: ES solutions - caracteristics and critical aspects. ES software and components. ES solutions - implementation and deployment. ES solutions and e-Business. ES solutions and Enterprise Modelling as a mean for alignment. ES solutionts in and between orgnisations. The role of ES solutions in and between organisations. LEARNING OUTCOMES: Knowledge and understanding: The students should understand basic concepts and terminology in Enterprise Systems. The students should understand technical and business issues in relation to Enterprise Systems. The students should understand the role of ES in a business context, including implementation and deployment. Skills and abilities: The students should be able demonstrate intellectual skills needed to elaborate on ES in a business context with a special focus on implementation. The students should be able to demonstrate intellectual skills needed to elaborate on ES issues in a business context with a special focus on implementation and deplyment. Assessment and attitude skills: The students should be able to reason about - and assess - various qualities related to implementation and deployment of ES. PREREQUISITES/QUALIFICATIONS: TEACHING METHODS: Lectures and seminars. EXAMINATION AND GRADES: Examination (5 credits) and Assignments (2.5 credits). The examination consists of two parts. The first part concerns the active participation on seminars, including short papers connected to each seminar. The second part of the examination is a written exam. LITERATURE: According to separate bibliography.

INFORMATION LOGISTICS - 7.5 ECTS

INFORMATIONSLOGISTIK MSC INFORMATICS

LEVEL: Master (A). CODE: TILD28. OBJECTIVES: Today's information flow is more a flooding than a purpose-oriented supply. The research field information logistics investigates concepts and technologies for demand-oriented information supply, i.e. providing not any information but only the "right" information "just-in-time" for a user's demand. The course examines advanced approaches in this field, including related subjects from knowledge representation, information retrieval and semantic matching. Intention of this course is to put students in touch with "State-of-Research" and to train their presentation and research skills. CONTENTS: The course includes relevant topics from information logistics, like: Demand modelling. Knowledge supply. Knowledge capturing. Semantic matching. Content management. Location-based information supply. LEARNING OUTCOMES: On completion of the course, the student should; Understand the main tasks of information logistics and the integration into enterprises. Have developed an ability to model and analyse information flow. Understand the specifics of demand modelling and which techniques to apply. Have an overview on techniques in semantic matching, content management and location-based information supply. Have detailed knowledge in one selected area of information logistics. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. Completed courses in knowledge modelling and knowledge management, enterprise modelling, research and inquiry methodology, object-oriented design, database technology and discrete mathematics. Basic knowledge in software engineering and distributed applications. TEACHING METHODS: Lectures, laboratory work, seminars and home assignments. EXAMINATION AND GRADES: Examination (4.5 credits), and Exercises and Assignments (3 credits). The course uses ECTS grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Fail for Swedish students. Exercises and Assignments: Pass or Fail. LITERATURE: According to separate bibliography.

INFORMATION RETRIEVAL - 7.5 ECTS

INFORMATION RETRIEVAL MSC INFORMATICS

LEVEL: Master (A). CODE: TIRD28. OBJECTIVES: A large share of information available on the Internet, in enterprises and public authorities, is semi-structured, i.e. office documents, web pages, pictures, videos etc. Searching, storing and retrieving this information requires specific mechanisms such as extracting key words and performing linguistic analysis. The course examines fundamentals and advanced approaches in this field of information retrieval. Intention of this course is to put students in touch with "State-of-Art" and to train practical retrieval skills. CONTENTS: The course includes relevant topics from information logistics, like: Information retrieval models. Retrieval evaluation. Text operations. Indexing and searching. Searching the web. LEARNING OUTCOMES: On completion of the course, the student should; Understand the main concepts of information retrieval and their application potential. Have developed an ability to use text operations in practical solutions. Be able to explain the most common indexing and searching approaches. Understand the specifics of retrieval evaluation and how to apply concepts from the field. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. Completed courses in knowledge modelling and knowledge management, database technology and discrete mathematics. Basic knowledge in software engineering and distributed applications. TEACHING METHODS: Lectures, laboratory work and home assignments. EXAMINATION AND GRADES: Examination (4.5 credits) and Laboratory work (3 credits).The course uses ECTS grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Fail for Swedish students. Laboratory work: Pass or Fail. LITERATURE: According to separate bibliography.

KNOWLEDGE MODELLING AND KNOWLEDGE MANAGEMENT - 7 ECTS

KUNSKAPSNMODELLERING OCH KUNSKAPSHANTERING MSC INFORMATICS

LEVEL: Master (A). CODE: TKKD28. OBJECTIVES: The main objective of the course is to provide students with a thorough understanding of concepts, techniques and methods for Knowledge Modelling and Knowledge Management. After completion of this course students shall be able to explain different modelling approaches and characteristics of good models. Furthermore, they shall be able to explain the key issues for concepts and methods for Knowledge Management. CONTENTS: The course includes the following topics: Conceptual Abstraction Concepts. Knowledge Modelling Paradigms and Languages. Ontology Modelling. Ontology Development. Life cycle of Organisational Knowledge. Knowledge Management enablers. Knowledge Management supporting systems and Processes. LEARNING OUTCOMES: On completion of the course, the student should: Understand different techniques useful for Knowledge Modelling and Knowledge Management. Be able to apply Knowledge Modelling Techniques and to develop complex Knowledge Models and Ontologies including the use of abstraction concepts. Have developed an ability to apply the key concepts of Knowledge Management and Reuse. Be able to identify Knowledge Management enablers and processes of developing organisational knowledge. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's program or equivalent. TEACHING METHODS: Lectures, laboratory work and home assignments. EXAMINATION AND GRADES: Examination (3.5 credits), Laboratory work and home assignments (3.5 credits). The course uses the report grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Underkänd for Swedish students. Laboratory work/home assignments: Pass or Fail. LITERATURE: According to separate bibliography.

SOFTWARE ENGINEERING METHODS - 7.5 ECTS

MJUKVARUTEKNIKMETODER MSC INFORMATICS

LEVEL: Master (A). CODE: TMMD28. OBJECTIVES: The primary objective of this course is to create an understanding of software development as an engineering process and to provide students with detailed knowledge on modern methods in software engineering. The course covers process models, typical phases and important results of each phase (artefacts). Emphasis will be on model-based approaches for specifying, designing and testing software, not on coding. CONTENTS: The course includes the following topics: Software Process Models. Software Specification (Requirements Engineering, Formal Specification). Software

Design (Architecture and System Structure, Architecture Styles). Validation and Verification. Software Evolution. Model-Based Software Engineering. Model-Driven Architecture. LEARNING OUTCOMES: After completion of this course, students shall: Have knowledge of different software process models and be able to choose an appropriate model for a specific development task. Be able to create a software requirements specification for a system under development. Have knowledge of using patterns in analysis and design. Be able to design an architecture of a software system using different architectural styles. Have knowledge of different approaches to software reuse. Be able to validate and verify the developed software systems and its parts. Have understanding of model-based approaches to software engineering. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. Completed Course in OOA/OOD, knowledge modelling and knowledge management, and discreet mathematics or equivalent. Courses/Experience in programming. TEACHING METHODS: Lectures, laboratory and project work. EXAMINATION AND GRADES: Examination (4 credits) and Laboratory and project work (3.5 credits). The course uses ECTS grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Fail for Swedish students. Laboratory work: Pass or Fail. LITERATURE: According to separate bibliography.

SOFTWARE QUALITY AND PROJECT MANAGEMENT - 7.5 ECTS

MJUKVARUKVALITETS- OCH PROJEKTSTYRNING MSC INFORMATICS

LEVEL: Master (A). CODE: TMPD28. OBJECTIVES: Software development projects should terminate "on time", without exceeding the project budget and delivering the desired result in the right quality. Software quality management and software project management help to reach these objectives. This course examines advanced approaches in this field. In the context of software quality this includes defining and assessing software quality as well as appropriate management systems. Furthermore, the relationship to software project management is investigated. CONTENTS: The course includes the following topics: Fundamentals of quality management. Standards for software process improvement (CMM, SPICE). Functional and non-functional quality features of software. Defining and assessing software quality. Software project management. Software risk management. Software cost estimation. LEARNING OUTCOMES: On completion of the course, the student should; Understand the main tasks of software project management and software quality management, and the integration between both areas. Have developed an ability to develop and optimize project plans, quality plans and project organization. Understand the specifics of process and product quality and be able to apply techniques for quality control. Have an overview on techniques in risk management, cost estimation, quality evaluation techniques and staff competences. Have detailed knowledge in one selected area of software quality and project management. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. Furthermore, completed courses in software engineering methods, knowledge modelling and knowledge management, enterprise modeling, research and inquiry methodology, or equivalent. Experience in software development and programming. TEACHING METHODS: Lectures, laboratory work, seminars and home assignments. EXAMINATION AND GRADES: Examination (4.5 credits) and Assignments (3 credits). The course uses ECTS grades A, B, C, D, E, FX, F for international students and 5, 4, 3, Fail for Swedish students. LITERATURE: According to separate bibliography.

COMPETITIVE PRODUCTION - 7.5 ECTS

KONKURRENSKRAFTIG PRODUKTION MSC PRODUCTION SYSTEMS

LEVEL: Master (A). CODE: TKPD27. OBJECTIVES: The course provides the students with knowledge on the production situation of manufacturing companies in a global competitive market, specifically addressing the production situation in small and medium sized companies. The course addresses factors influencing the efficiency and effectiveness of manufacturing as well as the importance of short-term and long-term development of the production capability. The course also gives knowledge and practice on how to analyze and structure scientific information in form of scientific articles and conference papers. The analysis will be presented in written and oral form and discussed in seminars. CONTENTS: The course includes the following topics: Competitive and sustainable manufacturing. Manufacturing in small and medium sized companies. Man – machine interaction. Organization of manufacturing. Product- and manufacturing system development. Logistics. LEARNING OUTCOMES: On completion of the course, the student should: Have knowledge and be able to explain manufacturing as a competitive factor. Have knowledge and be able to explain the role of manufacturing concerning welfare. Have knowledge and be able to explain the importance of a holistic view on manufacturing. Have knowledge about and understand the production situation of small and medium sized companies. Have knowledge and be able to explain the influence of product design on the manufacturing efficiency and effectiveness. Have knowledge and be able to- explain the role of the organization of manufacturing to attain efficient manufacturing systems. Have knowledge and be able to explain the importance of integrate the logistic system with product design and manufacturing system design. Have the ability to work in a group together with other students to accomplish reports and prepare and accomplish oral presentations. Have skills in written and oral presentation of scientific texts as well as how to critically and constructively participate in academic discussions at seminars. PREREQUISITES: Courses in Industrial engineering and management equivalent to 15 ECTS. TEACHING METHODS: Lectures and seminars. EXAMINATION: Examination 4 credits, seminars including written reports and oral presentation 3.5 credits. The grade on the course is Fail, 3, 4 or 5 based on the entire results from the examination and written reports. The grades on the seminars are Faild or Approved. LITERATURE: According to separate bibliography.

OPERATIONS STRATEGY - 7.5 ECTS

PRODUKTIONSSTRATEGI MSC PRODUCTION SYSTEMS

Level: Master (A). CODE: TPSR21. OBJECTIVES: The course aims at knowledge in formulation and implementation of operations strategies. CONTENTS:Introduction to operations strategy and its context, Operations strategy and performance, Strategy formulation process, Implementation of strategies. LEARNING OUTCOMES: On completion of the course, the student should: understand the role of operation strategies, understand how operation strategies are linked to performance, have knowledge about and describe in detail the content of an operations strategy, have knowledge about and describe in detail the

process of operations strategy, show good ability to carry out and present, in writing and orally, case work in group. PREREQUISITES: Courses in Industrial engineering and management equivalent to 15 ECTS. TEACHING METHODS: Lectures and case work. EXAMINATION: Written examination (7.5 hec) with the grades Failed, 3, 4, or 5/F-A ECTS. LITERATURE: According to a separate bibliography

PRODUCTION SYSTEMS DEVELOPMENT - 7.5 ECTS

PRODUKTIONSSYSTEMUTVECKLING MSC PRODUCTION SYSTEMS

Level: Master (A). CODE: TPID28 OBJECTIVES: The course aims at providing knowledge in design of production system, with respect to man, technology, and organisation. The course gives an insight in the importance of development process for design of production systems, where linkage to manufacturing strategies is central. CONTENTS: Manufacturing strategies and the need for, and relevance of, different production system solutions. Production system development including system and process perspectives, production philosophies, layouts, simulation and other tools for system development, work place design, work organisation, and long-term development ability. Realisation of production systems including projecting, purchasing, industrialisation, and hand-over. Evaluation of production systems. LEARNING OUTCOMES: On completion of the course, the student should have knowledge about and describe in detail how manufacturing strategies affect design and location of production systems. Have knowledge and give details about what a production system is based on a systems perspective , have knowledge and describe in detail the role of the development process when developing production systems , have acquaintance of and be able to give account for practical applications of production system design, have knowledge about and ability to apply different methods and tools useful when developing production systems, have knowledge about and ability to apply different methods and tools for evaluation of production systems, describe how different qualities of the production system affect the performance, have knowledge about and describe realisation of production systems, have knowledge of and give account for learning between production system development projects, show good ability to carry out and present, in writing and orally, project- and seminar work in group. PREREQUISITES: Courses in Industrial engineering and management equivalent to 15 ECTS, Competitive production, 7,5 ECTS, and Operations strategy, 7.5 ECTS. TEACHING METHODS: Lectures, seminars, and project work. EXAMINATION: Written examination (4.5 ECTS) with the grades Failed, 3, 4, or 5/F-A ECTS. Project (2 ECTS) with the grades Failed or Passed. Seminars (1 ECTS) with the grades Failed or Passed. Laboratory works and seminars are compulsory and active participation is required. LITERATURE: According to a separate bibliography.

LEADERSHIP - 6 ECTS

LEDARSKAP MSC PRODUCTION SYSTEMS

LEVEL: Master (A). CODE: TLER21 OBJECTIVES: The course aims at giving insights into the importance of leadership to work performance and to develop the participant's awareness of their own leadership style, as well as about cultural differences. CONTENTS: The course includes the following topics: understanding yourself and other people at work, theories, methods and models for creating effective work groups, approaches and strategies in leadership and management, managing effective organizations and change. LEARNING OUTCOMES: On completion of the course, the student should: have a knowledge of how leadership and management is affected by different cultures, especially in small and medium sized enterprises, be able to perform basic interpersonal communication skills such as active listening, feed back and influence. Have a good understanding of the importance of a clear (distinct) leadership for collaboration, integration and co-ordination processes. be able to analyze factors affecting performance and wellbeing in co-operation with others, be able to identify and prevent stress related reactions (own and others), have an understanding of, and be able to describe, different factors affecting individuals' work based learning, be able to show basic skills in developing efficiency through continuous improvements, have a knowledge of pros & cons of various forms of organizational structure. PREREQUISITES: Courses in Industrial engineering and management equivalent to 15 ECTS. TEACHING METHODS: Compulsory lessons, seminars and exercises. EXAMINATION: Written examination 2 ECTS with the grades Failed, 3, 4, or 5/F-A ECTS. Exercises and project 4 ECTS with the grades Failed, 3, 4, or 5/F-A ECTS. LITERATURE: According to a separate bibliography.

INTEGRATED PRODUCT AND PRODUCTION DEVELOPMENT 7.5 ECTS

INTEGRERAD PRODUKT- OCH PRODUKTIONSUTVECKLING MSC PRODUCTION SYSTEMS

Level: Master (A). CODE: TPPS22 OBJECTIVES: The course aims at providing the students with knowledge regarding how activities carried out and decisions taken during product development affects the possibilities to achieveefficient and effective production. CONTENTS: The course includes the following areas: the structure and contents of the product development process; product planning, product specifications, concept development, use of prototypes, etc., methods and approaches for design for manufacturing and assembly, the product architecture's impacts on production, collaboration between product development and production, cost analysis during product development. LEARNING OUTCOMES: On completion of the course, the student should: has gained knowledge about and will be able to describe the structure and contents of the product development process, will be able to describe and analyze how different product development activities and decisions affects the production, will be able to explain how the product architecture have affects the production, has developed an understanding for and will be able to describe various factors that affects the collaboration between product development and production, be able to relate a company's work in practice to theories addressing the collaboration between product development and production, has knowledge about methods and approaches that are used during product development to analyze and improve the manufacturability of a product, has gained knowledge about cost management methods that are used during product development, show ability that in a group carry out and present results from project and seminar assignments both in writing and verbally, as well as to provide critical and constructive feedback on such presentations. PREREQUISITES: Courses in Industrial engineering and management equivalent to 15 ECTS, Competitive production, 7,5 ECTS, and Operations strategy, 7.5 ECTS. TEACHING METHODS: Lectures, seminars, and project work. EXAMINATION: Written examination (3 ECTS) with the grades Failed, 3, 4, or 5/F-A ECTS. Project (3 ECTS) with the grades Failed, 3, 4, or 5/F-A ECTS. Seminars (1,5 ECTS) with the grades Failed or Passed. LITERA-

TURE: According to a separate bibliography.

SUPPLY CHAIN MANAGEMENT - 7.5 ECTS

LOGISTIK MSC PRODUCTiON SYSTEMS

LEVEL: Master (A). CODE: TLOS21. OBJECTIVES: The course aims at giving students knowledge of supply chains in a wider sense with some specialisation in logistics from the perspective of a manufacturing company. CONTENTS: The course includes the following topics: Analysis and management of supply chains. Design of supply networks. Demand management. Materials and production management. Inventory management. Distribution and transportation. Purchasing IT in the supply chain. LEARNING OUTCOMES: On completion of the course, the student should have knowledge of and be able to describe supply chains: understand how supply networks are designed. Understand and apply methods for demand management. Understand and apply methods for materials and production management. Understand and apply methods for inventory management. Have knowledge of and be able to give an account of distribution and transportation. Have knowledge of the significance of purchasing. Have knowledge of IT in the supply chain. PREREQUISITES/QUALIFICATIONS: Passed courses 180 credits in first cycle, at least 90 credits within the major subject Mechanical Engineering or Industrial Engineering and Management, and 22,5 credits Mathematics and completed courses Competitive Production 7,5 credits and Operations Strategy 7,5 credits (or the equivalent). TEACHING METHODS: Lectures and seminares. EXAMINATION AND GRADES: Examination (5 credits) and seminaries (2.5 credits). LITERATURE: According to a separate bibliography.

ADVANCED CASTING MATERIALS PROCESSING - 7.5 ECTS

GJUTNA MATERIAL OCH PROCESSER MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TGMS21. OBJECTIVES: The aim of the course is to give the students knowledge about metallic materials microstructure and its relation to mechanical properties, with focus on cast and heat treated materials. The perspective is to optimize the material and design in engineering applications. An introduction to advanced software and microscopy to explore material characteristics is discussed. CONTENTS: The course includes the following topics: Overview of casting materials and processes. Application of fundamental sciences to processing, microstructure evolution, and properties of iron-base-, aluminium- and magnesium-alloys. Physic-chemistry of liquid metal as applied to melting, refining and nucleation; solidification science and thermodynamics. Theoretical analysis and analytical relations for heat capacity, thermal expansion, thermal conduction in solids and liquids etc. Microstructure - properties correlation. Investigation of materials, material preparation and analysing methods including Scanning Electron Microscopy (SEM). LEARNING OUTCOMES: On completion of the course, the student should: Understand the specialty of casting processes and development of properties to be able to make optimal selections of alloy, design and casting process for advanced components. Be able to investigate a metallic material in a different perspective and be able to discuss with a material expert, different ways of development and alloy selection. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. TEACHING METHODS: Lectures/exercises and hands-on software training. Assignments and projects. Self study and information search can be included. EXAMINATION AND GRADES: Examination (6 credits) and home assignments (1.5 credits). LITERATURE: According to a separate bibliography.

APPLIED FINITE ELEMENT ANALYSIS - 7.5 ECTS

TILLÄMPAD FEM MED DIMENSIONERING MSC PRODUCT DEVELOPMENT

LEVEL: Bachelor (G). CODE: TFDS11. OBJECTIVES: The course objectives are: (a) to provide the fundamental concepts of the theory of the finite element method; and (b) to expose aspects of the application of the method to realistic engineering dimensioning problems through computational simulations using a major commercial general-purpose finite element code. CONTENTS: The course includes the following topics: Introduction to numerical methods. The basic concepts of FEM – structural analysis using pin-jointed elements. Generalisation to two- and three dimensions – continuum elements. Energy and variational approaches. Higher order quadratic elements. Practical guidelines for FE applications. Introduction to nonlinear FE analysis. Solid mechanics aspects of component design and damage mechanisms. LEARNING OUTCOMES: On completion of the course, the student should: Have an understanding of the basic theory behind the finite element method. Be able to describe different types of finite elements and their applicability in different situations. Have the necessary skills and knowledge to make effective use of a commercial FE-software package in understanding and solving engineering problems. Be able to discuss practices and methodologies regarding solid mechanics aspects of component design, including the identification of different damage mechanisms. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. TEACHING METHODS: Lectures and computer exercises. EXAMINATION AND GRADES: Examination (3.5 credits) and home assignments (4 credits). LITERATURE: According to separate bibliography.

COMPUTER PROGRAMMING FOR DESIGN AUTOMATION - 7.5 ECTS

PROGRAMMERING FÖR AUTOMATISERAD KONSTRUKTION MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TPAR20. OBJECTIVES: This course aims to give students basic knowledge and practical skill to use computer programming to automate engineering design processes. Focus is on system architecture and how to practically develop computer programs. CONTENTS: The course includes the following topics: Design Automation - Knowledge and data representation - Knowledge and data relations - Inference mechanisms - Knowledge and data handling - Algorithms - System

examples. Computer Programming - Basic programming operators - Functions - Object oriented programming - Graphical programming (visual components) - Events - API-programming - Databases - SQL. LEARNING OUTCOMES: On completion of the course, the student should: Be able to expand on what Design Automation is, fundamental concepts and how they connect. Have the skill to use a programming language and develop computer programs supporting Design Automation. Be able to connect several software applications into a whole system using API programming. Be able to set up databases and programmatically ask SQL questions. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme. TEACHING METHODS: Lectures, exercises, and assignments. EXAMINATION AND GRADES: Examination (2.5 credits), and assignments (5 credits). LITERATURE: According to separate bibliography.

COMPUTER SUPPORTED ENGINEERING DESIGN - 7.5 ECTS

DATORSTÖD FÖR KONSTRUKTION MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TDKS21. OBJECTIVES: The course focus is on the use of knowledge based computer technology to support and augment engineering design work. In particular, methods to wholly or partly automate different types of variant design, e g configuration, parametric design or platform based products, are treated. Both methodological and implementation oriented issues are addressed. CONTENTS: The course includes the following topics: Need for different types of computer support – analysis/synthesis. Classification of design tasks and design knowledge. Mapping of design processes and design knowledge. Representation of knowledge and reasoning. Matching of design problems and solution strategy - Configuration, parametric design and generative systems. Practical experience from industrial systems for automated design. A systematic procedure to develop systems for automated design. LEARNING OUTCOMES: On completion of the course, the student should: Have a good understanding of manual and automated design processes. Be familiar with techniques for automation of design processes. Be able to analyze a real design process to plan computer support and automation. Be able to create automated systems for configuration and parametric design. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's program and completion of the course Computer programming for design automation. TEACHING METHODS: Lectures, exercises, and assignments/project work. EXAMINATION AND GRADES: Examination (2.5 credits), and assignments/project work (5 credits). LITERATURE: According to separate bibliography.

CONCEPTUAL ENGINEERING DESIGN - 7.5 ECTS

KONCEPTKONSTRUKTION MSC PRODUCT DEVELOPMENT

LEVEL: Bachelor (G). CODE: TKKC18. OBJECTIVES: The course focuses the early phases of engineering design work and aims at giving insight into systematic methods applicable to a broad spectrum of problems in mechanical design, and to understand the principles that lie behind successful design solutions. CONTENTS: The course includes the following topics: Clarification of the design task. Creation of insight into product functions. Design of product families and IT-support for variant design. Optimal design solutions. Selection of manufacturing processes. The design process. LEARNING OUTCOMES: On completion of the course, the student should: Have knowledge of systematic methods for design work. Be able to apply methods for clarification of design task and design process. Have knowledge of methods to clarify functions of different solution principles. Understand the importance of planning for variant design and manufacturing methods. Have gained a well founded insight into the nature of engineering design. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. TEACHING METHODS: Lectures and home assignments. EXAMINATION AND GRADES: Examination (5 credits) and home assignments (2.5 credits). LITERATURE: According to separate bibliography.

INTEGRATED PRODUCT DEVELOPMENT - 7.5 ECTS

INTEGRERAD PRODUKTUTVECKLING MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TIPD27. OBJECTIVES: The aim of the course is to give the students knowledge and an understanding of how a product's design is affected by, and has effects on, important aspects related to different interested parties and life-cycle phases. The course will present different approaches to support integrated product development. The integration of design and production is specially emphasized. CONTENTS: The course includes the following topics: A holistic approach to product development and a life-cycle view on the product design. Methods and tools for integrated product development. Processes supporting integrated collaboration and related organizational issues. Integration of product models and product related information. Production aspects and product design properties that are mutually dependent. Cost estimation and costs analyzes in product development. Methods and approaches in product design for manufacture and assembly. LEARNING OUTCOMES: On completion of the course, the student should: Have knowledge of and be able to describe a holistic approach to product development and a life-cycle view on the product design. Have knowledge of and be able to describe different methods and tools for integrated product development. Have knowledge of and be able to describe processes supporting integrated collaboration and related organizational issues. Have knowledge of computer based tools supporting integrated product development. Have knowledge of and be able to describe how integration of product models and product related information can be achieve and used. Have knowledge of and be able to analyze how different production aspects is affected by the product design. Have knowledge of and be able to describe methods for cost estimation and cost analyzes in product development. Have knowledge of and be able to analyze the effects of manufacturing methods and production systems on the product design. Have knowledge of and be able to apply methods and approaches used in product development to analyze and enhance the producibility of a product. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme and completion of the course Conceptual Engineering Design or equivalent. TEACHING METHODS: Lectures, exercises, seminars and projects. EXAMINATION AND GRADES: Examination (3 credits), projects (3 credits) and home assignments (1.5 credits). LITERATURE: According to separate bibliography.

INTRODUCTION TO INDUSTRIAL DESIGN - 6 ECTS

INTRODUKTION TILL INDUSTRIDESIGN MSC PRODUCT DEVELOPMENT

LEVEL: Bachelor (G). CODE: TIDN10. OBJECTIVES: The objective of the course is to: Understand Industrial Design as a subject and in what context it is applicable. Create and understanding of design methods and how they interact with other methods in product development and adjacent disciplines. CONTENTS: The course contains the following elements: Design methods. Target group analysis. Design brief and functional analysis. Sketching. Design history. LEARNING OUTCOMES: After completing the course, students will have: Good understanding of design methods in the product development process. Good understanding of how design interacts with other disciplines. Good understanding of how to manage a design project. Understanding of contextual situations of products. Understanding of customer behaviour. Overview of project characteristics in design history. PREREQUISITES/QUALIFICATIONS: According to the entry requirements of the Master's Programme or equivalent TEACHING METHODS: Lectures, exercises, project work and written assignments. EXAMINATION AND GRADES: Written assignments and project work (6 credits). LITERATURE: According to separate bibliography.

MATERIAL AND MANUFACTURING PROCESSES - 7.5 ECTS

MATERIAL OCH TILLVERKNINGSMETODER MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TMTD28. OBJECTIVES: The aim of the course is to provide deep knowledge and understanding about engineering materials and manufacturing processes as well as an introduction to advanced process simulation software. CONTENTS: The course includes the following topics: Introduction to engineering materials and their application area. Review of material properties of steel alloys, aluminium wrought and cast alloys, magnesium alloys, composites and polymers. Introduction to manufacturing processes. Relationships between material selections and manufacturing processes. Overview of advanced process simulation software. Economical and environmental aspects in relation to material and process selections. LEARNING OUTCOMES: On completion of the course, the student should: Have an understanding of the relation between the microstructural and mechanical properties of engineering materials. Have knowledge of how material properties may be tailored by applying heat treatment and/ or thermo mechanical processes. Have knowledge and understanding of advanced manufacturing technology relevant to industry. Have an understanding of the complex interrelationships between materials properties and manufacture processes to optimize properties, productivity and robustness and integrate materials behavior and materials processing relevant to a wide range of industrial sectors. Have the ability to distinguish between the wide ranges of process simulation tools. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme and completion of the courses Advanced Casting Materials Processing and Modelling and Simulation of Casting, or equivalent. TEACHING METHODS: Lectures and projects. EXAMINATION AND GRADES: Examination (6 credits) and project work (1.5 credits). LITERATURE: According to separate bibliography.

MATERIALS AND DESIGN - 7.5 ECTS

MATERIAL OCH DESIGN MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TMDR20. OBJECTIVES: The aim of the course is to develop an ability to select the optimum material for a given engineering application with due consideration to functional requirements. In addition to materials properties and design requirements, tactile, visual and acoustic properties are also highlighted. CONTENTS: The course includes the following topics: Review of material properties and manufacturing processes. Introduction to material selection charts. Developing instructions for material selection. Surfaces, finishes and colours. Environmental impact of materials. Design for Manufacturing (DFM), Design for Assembly (DFA) and Design for Disassembly (DFD) will be treated. Industrial case studies. LEARNING OUTCOMES: On completion of the course, the student should: Understand different material properties useful for design. Be able to develop formal selection strategies using property limits and material performance indices. Have developed an ability to make rational choice regarding materials to be used for particular designs. Be able to communicate materials issues with experts, suppliers, customers and users. Have an understanding of materials impact on both human beings and environment. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. TEACHING METHODS: Lectures, exercises and hands-on software training. Project work. Literature studies. EXAMINATION AND GRADES: Examination (4 credits), with grade scale Fail, 3, 4, 5 as well as ETCS grades for the international students; and Project work (3.5 credits), with grade Pass or Fail. LITERATURE: According to a separate bibliography.

MODELLING AND SIMULATION OF CASTING - 7.5 ECTS

MODELLERING OCH SIMULERING AV GJUTNING MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TMSS20. OBJECTIVES: The aim of the course is to give an introduction on modelling and computer simulations of phenomena regarding heat and mass flows required to model and simulate the casting process. Furthermore the microstructure and the defect precipitation of the casting are simulated to obtain the final material properties as the tensile strength and hardness. Focus is set on understanding the influence of input material properties and boundary conditions. CONTENTS: The course includes the following topics: Fundamentals of heat and mass flow. Programming the flow phenomena. Use of professional casting simulation softwares. Validation of the casting simulation. LEARNING OUTCOMES: On completion of the course, the student should: Have basic knowledge on programming heat flow and solidification of metals. Be able to use professional simulation codes aimed to optimize casting processes and cast material properties. Be aware on the influence of boundary condition and input data on the simulation results. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme or equivalent. TEACHING METHODS: Lectures and computer exercises. EXAMINATION

AND GRADES: Examination (4 credits) and home assignments (3.5 credits). LITERATURE: According to separate bibliography.

NON-LINEAR FINITE ELEMENT ANALYSIS - 7.5 ECTS

OLINJÄR FEM MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TOLS21. OBJECTIVES: The aim of the course is to provide knowledge in the basics of the nonlinear finite element method. In particular provide knowledge in contact mechanics, plasticity, thermomechanics and transient analysis. CONTENTS: The course includes the following topics: Strong and weak formulation of a one-dimensional problem. The elasticity problem, continuum mechanics, FE-formulation (strong and weak formulation), isoparametric formulation, numerical intergration. Contact mechanics, Signorini's contact conditions, Coulomb's friction model, augmented Lagrangian formulation, Newton's method. Plasticity, associative plasticity, J2-plasticity, radial return. Thermomechanics, heat transfere, thermoelasticity, coupled problems. Transient analysis, implicit and explicit methods, Runga-Kutta's method, the central difference method, Newmark's method. Tutorials in Abaqus. LEARNING OUTCOMES: On completion of the course, the student should: Have a good understanding of the basics of nonlinear FEA, in particular, the basic principles of contact mechanics, plasticity, thermomechanics and transient problems. Be able to perform a nonlinear finite element analysis of a real application such as a drop test or metal forming. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme and completion of the courses Simulation of Rigid Body Systems and Applied Finite Element Analysis, or equivalent. TEACHING METHODS: Lectures and computer exercises. EXAMINATION AND GRADES: Examination (3.5 credits) and home assignments (4 credits). LITERATURE: According to separate bibliography.

OPTIMIZATION DRIVEN DESIGN - 7.5 ECTS

OPTIMERINGSDRIVEN DESIGN MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TODS21. OBJECTIVES: The aim of the course is to provide knowledge in the basics of design optimization, especially structural optimization by using FEA. CONTENTS: The course includes the following topics: Introduction to optimization driven design, structural optimization, size-, shape- and topology optimization, as well as surrogate optimization. Linear programming, the Simplex method, inner point methods. Topology optimization, SIMP-model, Sigmund's filter, sequential linear programming. Response surface optimization, successive response surface optimization, linear and quadratic response surfaces, the normal equation. Design of Experiments: factorial, Koshal, Box-Behnken, D-optimal. Scripting Abaqus/CAE by using Python. Alternative surrogate models: neural networks, radial basis functions. Zeroth order optimization methods: genetic algorithms, particle swarm algorithms. LEARNING OUTCOMES: On completion of the course, the student should: Know the basic principles of structural optimization and understand how these are used in the design process. Be able to perform topology- and surrogate optimization of structural problems. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's programme and completion of the courses Applied Finite Element Analysis (7.5 ECTS credits) and Non-linear Finite Element Analysis (7.5 ECTS credits), or equivalent. TEACHING METHODS: Lectures and computer exercises. EXAMINATION AND GRADES: Examination (3.5 credits) and home assignments (4 credits). LITERATURE: According to separate bibliography.

FINAL PROJECT WORK, MASTER - 30 ECTS

EXAMENSARBETE MASTER OF SCIENCE

LEVEL: Master (A). CODE: to be set. OBJECTIVES: The course shall give deeper knowledge and skills to make a study which shows the student's ability to apply, critically use and develop the knowledge that has been given by the education. This shall, preferably, be done in conjunction with companies, organizations or authorities. CONTENTS: The course includes the following areas: Collection, processing and analysis of data. Project planning. Project realization. Project report writing. Oral presentation of the project. To be an opponent for another master thesis report and presentation. LEARNING OUTCOMES: On completion of the course, the student should: Be able to use scientific methods and approaches when a project assignment or study is done. Be able to treat problems of general nature kunna and be able to show what is general in the actual problem. Show deepened ability to critically use the knowledge and the skills which have been acquired during the education. Have considerably deepened, widened and elaborated his knowledge within the main subject of the program. Be able to put his study in relation to actual research in the area. Be able to show awareness about strengths and weaknesses of the actual study. Be able to search, process and analyze relevant information and knowledge. Be able to write a scientific report and orally present the contents. PREREQUISITES/QUALIFICATIONS: The final project work can be started after acceptance by examiner. At least 50 % of the courses on advanced level should have been passed. TEACHING METHODS: The student does, alone or in a group, a final project work within the main subject of the program. A supervisor and an examiner are appointed for every final project work. School of Engineering guide lines shall be used during the final project. EXAMINATION AND GRADES: The course is examined through a written project report, an oral presentation of the project report, opposition by another group, and compulsory attendance at another group's oral presentation. The grades that will be used will be either pass or fail and ECTS-grades. LITERATURE: According to separate bibliography.

FOLLOWING COURSES IN THE MASTER PROGRAM "INDUSTRIAL DESIGN" CAN ONLY BE TAKEN IF A COMPLETE SEMESTER IS CHOSEN. THE STUDENTS MUST BE ADMITTED TO A PROGRAM IN INTUSTRIAL DESIGN WITHIN MECHANICAL ENGINEERING AT THE HOME UNIVERSITY. APPLICANTS MUST ATTACH THEIR PORTFOLIO TO THE EXCHANGE APPLICATION AND ALSO DO AN APPLICATION ASSIGNMENT, SEE ON THE WEBSITE *HTTP://HJ.SE/JTH/EN/EDUCATION/MASTER-OF-SCIENCE/INDUSTRIAL-DESIGN.HTML*. LIMITED NUMBER OF PLACES. SEE PAGE 26 IN THIS CATALOUGE FOR FULL DESCRIPTION OF THE MASTER PROGRAM.

DESIGN COMMUNICATION I - 7.5 ECTS

SEMESTER I — MSC PRODUCT DEVELOPMENT

LEVEL: Bachelor (G). CODE: TD1N10 OBJECTIVES: The purpose of this course is to provide a basic knowledge of different methods and tools to visualize and communicate ideas through sketches, digital model and physical model, and present them orally to a group. The course also aims to train the artistic ability and capacity for creative and innovative thinking. The course aims to train the ability to deal with form and color and how it interacts with product function. CONTENTS: The course covers the following areas: Sketch Technology. Color and shape. Croquis. Concept Generation. Physical models. Digital models. Photo Rendering. Terminology. LEARNING OUTCOMES: After completing the course, students shall: have developed a good level in order to communicate with the help of sketches. Have knowledge of, and how to make, physical models of different types and purposes and caracters. Be able to manage and visualize using CAID. Have a knowledge of color and shape and which aspects of a product that controls expression and identity. PREREQUISITES/QUALIFICATIONS: According to the masters program (or the equivalent) TEACHING METHODS: Lectures, tutorials, laboratory work, project work and assignments. EXAMINATION AND GRADES: Assignments and Project Work (7.5 credits) LITERATURE: According to separate bibliography.

DESIGN PHILISOPHY AND PRACTICE - 7.5 ECTS

SEMESTER I — MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TDPR20 OBJECTIVES: This course will provide knowledge and understanding of the design work philosophy and practice and the design process, from concept to concept proposals. It will also train skills in expressing, reflecting and shaping in speech, writing and in form. CONTENTS: The course covers the following areas: The practical knowledge formation in the creative work. The aesthetics and philosophy of creation. Analogical thinking. Interpretation and perception. Written reflection. Narration. Presentation. LEARNING OUTCOMES: After completing the course, students: have gained insight in the creative work process and practical knowledge formation. Have trained in expressing form and feeling in a linguistic as well as in a shaping form. Have trained in the use of written reflection as a method for knowledge building. Be trained in developing an idea into a concept proposal and put it in a form, text and image. Have trained in the language and verbally able to shape and communicate an idea in a development. Have gained insight into their own unique talent and ability.PREREQUISITES/QUALIFICATIONS: According to the masters program (or the equivalent) TEACHING METHODS: Teaching is through lectures, exercises and seminars. EXAMINATION AND GRADES: Individual Assignments (2 credits) and Project Work (5.5 credits) LITERATURE: According to separate bibliography.

INTRODUCTION TO INDUSTRIAL DESIGN - 6 ECTS

SEMESTER I — MSC PRODUCT DEVELOPMENT

LEVEL: Bachelor (G). CODE: TIDN10. OBJECTIVES: The objective of the course is to: Understand Industrial Design as a subject and in what context it is applicable. Create and understanding of design methods and how they interact with other methods in product development and adjacent disciplines. CONTENTS: The course contains the following elements: Design methods. Target group analysis. Design brief and functional analysis. Sketching. Design history. LEARNING OUTCOMES: After completing the course, students will have: Good understanding of design methods in the product development process. Good understanding of how design interacts with other disciplines. Good understanding of how to manage a design project. Understanding of contextual situations of products. Understanding of customer behaviour. Overview of project characteristics in design history. PREREQUISITES/QUALIFICATIONS: According to the entry requirements of the Master's Programme or equivalent TEACHING METHODS: Lectures, exercises, project work and written assignments. EXAMINATION AND GRADES: Written assignments and project work (6 credits). LITERATURE: According to separate bibliography.

MATERIALS AND DESIGN - 7.5 ECTS

MATERIAL OCH DESIGN — MSC PRODUCT DEVELOPMENT

Course description can be found at page 45.

MULTI-CULTURAL COMPETENCE - 1.5 ECTS

SEMESTER I — MSC PRODUCT DEVELOPMENT

LEVEL: Bachelor (G). CODE: TMÅA17 OBJECTIVES: The aim of the course is to train national and international students in the basics of intercultural communication that leads to multi-cultural competence and personal long lasting friendship. CONTENTS: The following areas will be addressed in the course: Communication and culture, worldview, ethnocentrism, egocentrism, be a likeable person, avoid stereotyping, cultural values, language and non-verbal communication, the cross-cultural adaptation process, becoming interculturally competent. LEARNING OUTCOMES: On completion of the course, the student

should be able to: Define and recognize cultural factors that affect the communication process. Show understanding of the sociological and psychological signs a person goes through during the adaptation to a new culture. Reflect over the process of becoming interculturally competent. Develop skills in team working with colleges from other cultures. Take personal responsibility for becoming a raw model in intercultural contacts. PREREQUISITES/QUALIFICATIONS: Registered in a JTH Masters Programme (or the equivalent) TEACHING METHODS: Lectures, structured discussions in multi-culture groups with written and oral reports, seminar around written assignments. EXAMINATION AND GRADES: Examination (1.5 credits). LITERATURE: According to separate bibliography.

BUSINESS AND ECOMONICS - 6 ECTS

SEMESTER 2 MSC PRODUCT DEVELOPMENT

LEVEL: Bachelor (G). CODE: TFEK11 OBJECTIVES: The course aims to give students an insight into the conditions of social scientific knowledge production and convey a development-oriented approach to business. Furthermore, the course aims to provide knowledge contains elements of both detailed knowledge of global principles. Both the established firm as the new company should be treated. The first scenario emphasizes the analysis, planning and management. The second emphasizes creativity, innovation and action tendency as important components of entrepreneurship. These two aspects are not in contradiction, but are in very highly supplementary to understand the business and entrepreneurship in a broad sense. Besides, the course will introduce two different concepts of Accounting, management and financial, to students. By providing accounting assignments within the course, students will be able to identify different categories of accounts aiming to record all financial transactions that result in preparing financial statements of a company. The course covers both the overall business principles and entrepreneurial expertise. CONTENTS: After completing the course, students will have detailed knowledge in selected areas: Business planning. Financial control. Organization and leadership. Accounting. Marketing. LEARNING OUTCOMES: The learning objectives of the course are: To have a better understanding of global business principles. To achieve a better understanding of the ntrepreneurial approach. To identify a business opportunity and formulate a business idea. To understand how market conditions affect the development of new products. To have a greater understanding of how the company starts and operates in a businesslike manner. To understand the concept of Accounting and how financial accounting and book- eeping mechanism work. PREREQUISITES/QUALIFICATIONS: General entry requirements and completed 15 credits in Mathematics (or the equivalent). TEACHING METHODS: The education is given in the form of lectures, project work and assignments. EXAMINATION AND GRADES: Examination (6 credits). LITERATURE: According to separate bibliography.

DESIGN COMMUNICATION 2 - 9 ECTS

SEMESTER 2 MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TD2S21 OBJECTIVES: The course will provide in-depth knowledge of various methods and tools to visualize and articulate design attributes. Further more, the students will practice the ability to effectively communicate ideas through sketching, digital model and physical model. The course provides knowledge to practice the ability to manage colour, shape, surface and materials and how it interacts with the products function, identity and expression. Furthermore, the course will provide knowledge of design practice end the ability to from a given problem definition solve problems in an innovative and artistic way with a humanistic and technical perspective. An additional aim of this course is to practice the ability of oral presentation, discussion based on the topic where terminology in an understandable way towards a partner. CONTENTS: The course covers: Sketch Technique. Colour and shape, surface, materials Design Management. Concept Generation Environmental impact. Natural Designs. Design Methodology. Semantics and semiotics. Controlled milling. Photo Rendering. Design Terminology. Rapid Prototyping. LEARNING OUTCOMES: After completing the course, students shall: Be highly skilled in various drawing techniques in order to communicate ideas and concepts. Understand and discuss and are the colours and form problems. Be able to presents a project verbally and visually in a clear and informative way. Be able to use different techniques in order to create physical models that provide detailed information about colour, shape, surface textures and materials. Be able to independently operate their own projects. PREREQUISITES/QUALIFICATIONS: Completed courses on bachelor level 180 credits, 90 credits within the major subject Mechanical Engineering or Civil Engineering and completion of the course Design Communication 1 7,5 hp (or the equivalent). TEACHING METHODS: Teaching is trough lectures, exercises and seminars. EXAMINATION AND GRADES: Assignment and Project Work (9 credits). LITERATURE: According to separate bibliography.

ERGONOMICS - 7.5 ECTS

SEMESTER 2 MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TPER21 OBJECTIVES: The objective is to provide an overall understanding of the importance of ergonomics in product development. The course will also provide knowledge of the man-machine interface and basic understanding of the possibilities and limitations of the body. CONTENTS: The following areas will be addressed in the course: Anatomy and physiology. Anthropometry. Ergonomics. Biomechanics. Cognition and perception. Product study. Interviewing techniques and surveys. LEARNING OUTCOMES: After completing the course, students will: Have a knowledge of the interface between man and machine. Have a knowledge of the possibilities and limitations of the body. Have an understanding of the possibilities and limitations of the body. PREREQUISITES/QUALIFICATIONS: Passed courses 180 credits in first cycle, at least 90 credits within the major subject Mechanical Engineering or Civil Engineering, and 22,5 credits in Mathematics (or the equivalent). TEACHING METHODS: The education is given in the form of lectures, project work, wrirren assignments och examination. EXAMINATION AND GRADES: Project Work (6 credits) and Examination (1.5 credits). LITERATURE: According to separate bibliography.

MAN LIGHT AND SPACE - 7.5 ECTS

SEMESTER 2 ELECTIVE COURSE: CHOOSE BETWEEN THIS AND TMSB17 (MATHEMATICAL STATISTICS) MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TMÄD27 OBJECTIVES: To provide fundamental knowledge of the science of lighting and the light fitting development process. CONTENTS: The following areas will be addressed in the course: Science of light. Man, light, space and colour. Knowledge of light fittings. Process of light fitting development. Knowledge of light sources. Controls. Laboratory assignments. Study visits. Project work. LEARNING OUTCOMES: After completing the course, students will: Understand the role and impact of light on humans- be aware of the basics of the science of lighting. Have a basic knowledge of the most common light sources. Have a basic knowledge of light fittings. Understand and be aware of basic theory in the lighting planning process. Be aware of the principles of control and regulation. PREREQUISITES/QUALIFICATIONS: According to the eligibility rules of the Master's program (or the equivalent). TEACHING METHODS: Instruction is in the form of lectures, project work, written assignments, examination and project work. EXAMINATION AND GRADES: Project Work (4 credits) and Examination (3.5 credits). LITERATURE: According to separate bibliography.

MATHEMATICAL STATISTICS - 7.5 ECTS

SEMESTER 2 ELECTIVE COURSE: CHOOSE EBETWEEN THIS AND TMÄD27 (MAN LIGHT SPACE) MSC PRODUCT DEVELOPMENT

Course description can be found at page 35.

DESIGN COMMUNICATION 3 - 10.5 ECTS

SEMESTER 3 MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TD3S20 OBJECTIVES: The course will provide in-depth knowledge of how to implement different methods and tools to visualize and express the field of in-dustrial Design of real projects where the emphasis will be on to effectively communicate ideas through sketches, digital model and physical model. The course provides knowledge to practice the ability to manage colour, shape, surface and materials and how it interacts with the products function, identity and expression. Furthermore, the course will provide knowledge of design practice and the ability to from a given problem definition solve problems in an innovative and artistic way with a humanistic and technical perspective. Cooperation with business can occur. Students are encouraged to develop their own personal profile and mannerism. CONTENTS: The course covers: Sketch Technique. Colour and shape, surface, materials . Design Management. Concept Generation Environmental impact. Natural Designs. Design Methodology. Semantics and semiotics. Controlled milling. Photo Rendering. Design Terminology and Vocabulary. Rapid Prototyping. LEARNING OUTCOMES: After completing the course, students shall: Have highly developed skills in various drawing techniques to communicate ideas and concepts in a quick and informative way. Be highly skilled in various drawing techniques in order to communicate ideas and concepts. Understand and discuss and are the colours and form problems. Be able to presents a project verbally and visually in a clear and informative way. Have expertise in using different techniques in order to create physical models that provide detailed information about colour, shape, surface textures and materials, as well as graphics and trademarks to create new products to a specific audience. Be able to independently operate their own projects from a given design brief. PREREQUISITES/QUALIFICATIONS: Completed course Design Communication 2, 9 credits (or the equivalent). TEACHING METHODS: Teaching is trough lectures, exercises and seminars. EXAMINATION AND GRADES: Assignment and Project Work (10.5 credits). LITERATURE: According to separate bibliography.

DESIGN RESEARCH METHODOLOGY - 4.5 ECTS

SEMESTER 3 MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TDFR21. OBJECTIVES: The course will provide knowledge in research methodology in general, and design research methodology in specific. The course will give knowledge about the border between Art and science, and how design science relates to that issue. Further more the course will provide knowledge about design science and its practice. The course provides the students a good base for research work and research studies. CONTENTS: The course includes the following topics: Nature of research. Design research. Research methods. Philosophy of science and pedagogy. Written presentation LEARNING OUTCOMES: After completing the course, students: have gained insight in design research methodology. Have gained insight in general research methodology. Will be prepared for research careers in academic institutions. Have trained in written reflection as a method for knowledge building. Have a gained a knowledge about the difference between Art, design an science. PREREQUISITES/QUALIFICATIONS: Completed courses on bachelor level 180 credits, 90 credits within the major subject Mechanical Engineering or Civil Engineering and 15 credits Mathematics (or the equivalent). TEACHING METHODS: Lectures, exercises and seminars. EXAMINATION AND GRADES: Project Work (3 credits) Exercises and Assignments (1.5 credits). LITERATURE: According to separate bibliography.'

INDUSTRIAI DESIGN PROJECT- 15 ECTS

SEMESTER 3 MSC PRODUCT DEVELOPMENT

LEVEL: Master (A). CODE: TIDR21. OBJECTIVES: The course will provide knowledge in project work in general, and design project work and its methodology in specific. The course will give knowledge about how to make a whole out of a product concerning possiblities and constrains. Further more the course will provide knowledge about designstragies and designmanagent. CONTENTS: The course covers: Market, market and trend analysis. Product Strategy and selection strategy. Design Mana-

gement. Applied Project Management. Environmental impact. Cognition and perception. Graphic design, product graphics. Semantics and semiotics, and information ergonomics. User studies. Written and oral presentation. Aesthetics and management of perceived values. LEARNING OUTCOMES: After completing the course, students: Have gained insight in design methodology and how to run a designproject. Have gained insight in how a project work is planned and inplementation to a client. Will be prepared for designwork and a provide a professional identety as designer. Have trained in written reflection as a method for knowledge building. Have a gained a knowledge about designmanagent. Have a gained a knowledge about how to create a meaning of a product by design. PREREQUISITES/QUALIFICATIONS: Passed courses 180 credits in first cycle, at least 90 credits within the major subject Mechanical Engineering or Civil Engineering, and 15 credits Mathematics (or the equivalent). TEACHING METHODS: Lectures, exercises and seminars. EXAMINATION AND GRADES: Project Work (13 credits) Exercises and Assignments (2 credits). LITERATURE: According to separate bibliography.

FINAL PROJECT WORK, MASTER - 30 ECTS

SEMESTER 4 MASTER OF SCIENCE

Course description can be found at page 46.

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