AARHUS
UNIVERSITY
SCHOOL OF ENGINEERING

Academic Regulations for the Electronic Design Engineer Study Programme 2013

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Introduction

The current academic regulations have been prepared in accordance with the Danish Ministry of Science, Innovation and Higher Education's Ministerial Order No. 527 of 21 June 2002 on the Bachelor of Engineering study programme.

Aarhus University, School of Engineering offers a study programme in Electronic Engineering (in Danish), and Aarhus University, Herning offers a study programme in Electronic Design Engineering (in English). Both study programmes are based on the same regulatory framework, but due to the difference in language instruction as well as geographical location, there will be slight deviations. As a result, two academic regulations have been prepared.

The study programme in Electronic Engineering is available here (in Danish).

The current academic regulations describe how the study programme in Electronic Design Engineering at Aarhus University, Herning is composed.

The academic regulations have been prepared in accordance with rules established by law or ministerial orders, or rules established by Aarhus University, School of Engineering.

Course descriptions for each course at the Electronic Design Engineer study programme are available in the online course catalogue.

Period of validity

The academic regulations were approved by the Board of Studies, Aarhus School of Engineering in August 2012. They apply to students who begin their studies in August 2012 or later.

Admission requirements

Admission to the Bachelor of Engineering study programme requires an upper secondary school examination (equivalent to 12 years of school, e.g. *HTX*, *HF*, *STX*, *EUX* and admission course).

In the qualifying examination, the applicant must have passed mathematics at 'A'-level (minimum 375 hours of instruction), physics at 'B'-level (minimum 200 hours of instruction) and chemistry at 'C'-level (minimum 75 hours of instruction). The applicant must have achieved a minimum of 02 in weighed average of the concluding term marks and examination marks in all three subjects.

If the qualifying examination has been passed according to the Danish 13-step scale, the concluding term marks and examination marks must be 6.

The applicant may be eligible for admission if s/he holds a degree that has provided the skills corresponding to the above levels.

Non-Danish degrees are assessed on an individual basis, and, if possible, conversion of marks is made.

Objective of the study programme

The objective of the Bachelor of Engineering in Electronic Design, cf. the Ministerial Order, is to qualify the student to perform professional tasks nationally and internationally. They must be able to:

- translate technical research results as well as scientific and technical knowledge into practical applications in development assignments and in solving technical problems
- critically acquire new knowledge within relevant engineering fields
- solve commonly occuring engineering tasks independently
- plan, realise and manage technical and technological systems, taking into account societal, economic, environmental as well as occupational safety and health-related aspects when solving technical problems
- enter into cooperative and management functions and contexts at a professional level with people who have various educational, linguistic and cultural backgrounds.

The study programme is incorporated into the development environments at Aarhus University. Thus, the programme qualifies for participation in the operation and development of the engineering profession as well as for further education at master level, e.g. a Master of Science in Engineering.

Qualifications and skills

To reach the overall objective, the student must acquire:

- theoretical qualifications
- basic academic and professional qualifications and skills
- specific professional qualifications and skills as well as general engineering skills

Theoretical qualifications:
During the course of study, the student must acquire theoretical knowledge within basic theoretical subjects such as mathematics, physics, electronics and computer science, thereby obtaining more specific professional qualifications and prerequisites for further education.

Basic professional qualifications and skills:
The student must, primarily during the first four semesters of the study programme, acquire basic professional qualifications and skills in the following key areas:

- *Electrical, electronic and optical components*
- *Basic circuit analysis*
- *Electronic building blocks*
- *Mathematics and signal processing*
- *Programming methods and programming languages*
- *Computer architecture*

Specific professional qualifications and skills:
The student must, primarily during the last three to four semesters, acquire specific professional qualifications and skills within one or more relevant academic areas.

General engineering skills:
During the course of study, the student must acquire skills in order to critically, efficiently and methodologically:

- solve commonly occurring engineering tasks independently, including translating technical research results as well as scientific and technical knowledge into practical applications in development assignments and in solving technical problems
- seek, acquire and relate to new knowledge
- enter into cooperative and management functions and contexts at a professional level with people who have various educational, linguistic and cultural backgrounds
- be able to plan and prioritise tasks, plan and manage meetings as well as qualify assure the work performed on the basis of established objectives
- outline and analyse technical problems based on narrow technical criteria as well as a wide societal and scientific perspective
- work with problem solving and relate to the achieved results based on established prerequisites, assumptions and simplifications in the method applied
- communicate – both orally and in writing – technical problems, analyses and results, including preparing simple and legible reports, drawings and descriptions taking into consideration the receiver's background
- use common IT tools, including calculation programmes, for the problem-solving process and presentation.

Job functions

The Bachelor of Engineering aims to qualify graduates to carry out various tasks from development of mass-produced electronics to design of high-technology specialised equipment.

The study programme will qualify the graduate to work in a private or public company and carry out tasks such as:

- Development of electronics or other data-technical or electrical engineering solutions for devices and systems
- Project management when developing or operating electrical engineering devices and systems
- Counselling when introducing or purchasing electrical engineering devices and systems
- Maintenance or sale of electrical engineering devices and systems
- Other tasks in connection with electrical engineering devices and systems.

Professional title

Graduates are entitled to use the title (in Danish): *Diplomingeniør*
with the specification *Electronic Design Engineer*.

In English:
Bachelor of Engineering
with the specification *Electronic Design Engineer*.

Graduates who have completed electives, projects and the final project within the same subject area may take the title of Bachelor of Engineering with a specialisation.

The specialisation title is agreed upon with the degree programme coordinator, cf. "Application procedure for specialisation in Electronic Engineering/Electronic Design Engineering".

Study programme structure

The duration of the study programme is 3½ years full-time study, corresponding to a teaching load of 210 ECTS credits. 1 ECTS credit corresponds to 27 hours of study activity for a student.

The study programme consists of the following elements:

a. Compulsory courses
b. Engineering placement
c. Specialisation based on electives and projects
d. Final project
e. Electronic workshop course

a. Compulsory courses

The study programme consists of compulsory courses and projects corresponding to 75-150 ECTS credits. The contents of the compulsory courses and projects include basic knowledge and skills characterising the engineering education.

b. Engineering placement

The engineering placement is an integrated part of the Bachelor of Engineering study programme. The duration of the engineering placement is five months, corresponding to 30 ECTS credits. The engineering placement is described further in the course description (available on Blackboard) and the contract form is available on the Student Portal.

c. Specialisation based on electives and projects

The study programme provides the opportunity for students to choose a specialisation based on a number of electives. The specific electives in electronics can be found in the online course catalogue.

The subject element includes elective courses and projects corresponding to 15-90 ECTS credits. The student can choose a maximum of 10 ECTS credits among courses without a predominantly mathematical-scientific or technical-engineering focus (business courses).

d. Final project

The Bachelor of Engineering in Electronic Design is completed with a final project of 25 ECTS credits.

The final project is usually based on a problem from the engineering profession, but it may also deal with a concrete sub-problem from a development project.

The idea of the final project is to give the student an opportunity to apply the acquired knowledge independently in a larger project. The student must demonstrate the ability to apply engineering theories and methods within a specified subject as well as explain the results in a logical and coherent manner in both written and oral form.

e. Electronic workshop course

For students without relevant practical prerequisites, the study programme includes a five week workshop course. The purpose of the workshop course is to provide an understanding of electronic components and how electronic systems are built.

Business engineer

As part of the Bachelor of Engineering, 7th semester students have the opportunity to continue their studies with the specialisation 'Business Engineer' immediately after graduation (as an 8th semester). The specialisation adds 30 ECTS credits to the Bachelor of Engineering (i.e. a total of 240 ECTS credits). For more information, see the academic regulations for the Business Engineer specialisation (in Danish).

Teaching structure

The following teaching and working methods are used. Most often, it will be a combination of two or more of these:

Courses
The aim of a course is to provide the student with qualifications within a specific subject area. However, other academic elements may also be part of the course in order to ensure that the student obtains a general understanding of the course, including how each course is integrated.

Assignments
Assignments may vary from solving small problems to larger assignments used as a basis for approval or admission to an examination.

Projects
Projects include both academic activities and activities supporting learning, management and participation in project work as well as any other personal qualities.

Final project
The final project is prepared before 7th semester, cf. the study overview.

Electronic workshop course
Students who are admitted to the Bachelor of Engineering study programme without a relevant vocational education must attend a five week electronic workshop course during the study. This ensures that the students have the necessary practical skills in order to benefit as much as possible from the theoretical study.

Academic progression

Courses may occur progressively which means that qualifications in one or more subjects are obtained (and possibly required) through participation in specific courses in a predefined sequence.

Types of examinations and assessment

Examinations are used to continuously assess whether the student has achieved a satisfactory level of professional competencies within one or more courses or projects. When the student is enrolled in a course, s/he is automatically registered for the examination. In the detailed overview of the study programme (see Appendix 2), each course is described in terms of type of examination/assessment method, reexamination (second examination attempt) and assessment.

The following assessment methods are used:

- Written examination
- Oral examination
- Project examination

– Or a combination/combinations of these.

The assessment may be:

- One mark according to the Danish 7-step scale
- Passed/not passed
- Approved/not approved

To pass a subject, the student must obtain a mark of at least 02 or above or "passed".

The following types of examination are used:

Ordinary examination
For students who have participated in the teaching. The examination takes place shortly following the teaching period. The student is automatically registered for this examination.

Reexamination (registration for a reexamination)
For students, who have used an attempt, but failed the previous ordinary examination. The student must actively register for the reexamination.

Make-up examination (reexamination due to illness)
For students who can document illness during an ordinary examination or reexamination.

Reexamination (complaints)
A reexamination following a complaint may be granted by Aarhus University, School of Engineering.

Registration for a reexamination
The possibility, if any, to register for a reexamination or resubmitting assignments for assessment is specified in the course descriptions (see the course catalogue) and in the detailed overview of the Electronic Design Engineer study programme (see Appendix 2).

Rules for attending classes and examinations

- General requirements:
  - Some courses may require other courses as prerequisites (stated in the course descriptions under 'Prerequisites'). A student is not allowed to attend the teaching or an examination in a course where prerequisite courses, if any, have not been passed.
- Specific requirements for each semester:
  - 1st semester: Current admission requirements
  - 2nd semester: At least 25 ECTS credits from 1st semester must be passed
  - 3rd semester: 1st semester must be passed as well as at least 25 ECTS credits on 2nd semester
  - 4th semester: 1st and 2nd semester must be passed as well as at least 25 ECTS credits on 3rd semester
  - Engineering placement: A student must have completed 90 ECTS credits of the compulsory courses before a contract can be made
  - Final project: 1st to 5th semester must be passed.
- Exemptions:
  - If a student does not meet the above requirements, an exemption may be granted, describing the specific courses that the student must attend to graduate.

Marking
The evaluation is assessed by:

1. Examiner(s) only (internal)
2. Examiner(s) and an external examiner (external)

The examiner(s) is (are) typically the lecturer(s) associated with the course. An external examiner is a member of a corps of external examiners which has been approved by the Danish Ministry of Science, Innovation and Higher Education.

Deadlines

The following deadlines apply to complete the Electronic Design Engineer study programme:

- Before the end of the second year of study, all 1st semester courses must be passed
- To be actively studying, the student must attend at least one examination within 12 months
- The entire education must be completed within seven years after admission to the study programme.

If the above-mentioned deadlines are not met, the student is terminated from registration at Aarhus University. However, in special circumstances, Aarhus University, School of Engineering may grant exemption from the deadlines.

For more information, see the Student Portal.

Requirements for passing the study programme

The Bachelor of Engineering study programme is passed when the student has completed and passed courses, project and placement (cf. the paragraph on Study programme structure), corresponding to at least 210 ECTS credits.

A student has three attempts to pass a course.

Internationalisation

The engineering placement, courses and the final project may, after approval by the degree programme coordinator, take place in foreign companies or at engineering-relevant institutions.

Studying abroad must not prolong the period of study. In addition, the student must choose courses that, as regards to content, have not already been passed.

Students studying abroad are evaluated at the foreign institution. It is the student's responsibility to document that the course at the foreign institution is passed.

Exchange students

Incoming exchange students must fill in an online application form as well as a Learning Agreement confirming that the proposed programme of study at Aarhus University, School of Engineering can be approved by the sending institution as part of the education.

In order to attend a course in English, the following must be documented:

- Academic level (minimum two years of study at an equivalent study programme)
- English proficiency (TOEFL test with a minimum score of 550 or equivalent)
- Preliminary approval from the sending institution

- Completion of minimum one semester in English in order to be approved to register for the final project.

Credit transfer

On the basis of concrete, individual applications, the Board of Studies may approve credit transfer for parts of the study programme. Courses passed at another educational institution may replace a concrete course at Aarhus University, School of Engineering. Apply for credit for a course here.

Students with relevant engineering work experience may be granted credit transfer for the engineering placement by Aarhus University, School of Engineering. On Blackboard, the form for applying for credit transfer is available.

In accordance with the Ministerial Order No. 527 of 21 June 2002, section 22, courses passed at other educational institutions may be eligible for credit transfer as part of the study programme.

Formal admission requirements must be fulfilled:
An upper secondary school, including mathematics at A-level, physics at B-level and chemistry at C-level.

Exemptions

Under special circumstances, the Board of Studies may exempt from the rules in the academic regulations provided that it does not conflict with the Danish Ministry of Science, Innovation and Higher Education's ministerial orders. For more information, see Blackboard and the Student Portal.

Further education

The Bachelor of Engineering provides the opportunity to acquire a Master of Science in Engineering. Read more about the admission requirements here.

Transitional regulations

Students enrolled in previous academic regulations are transferred to the current academic regulations based on an individual assessment of credit transfer.

List of documents referred to in the current academic regulations

Regulatory framework

The Bachelor of Engineering study programme is governed by the following ministerial orders (in Danish):

- Ministerial Order No. 527 of 21 June 2002 on the Bachelor of Engineering
- Ministerial Order No. 214 of 21 February 2012 on Admission, Registration and Absence of Leave
- Ministerial Order No. 262 on the Grading Scale and Other Forms of Assessment
- Ministerial Order No. 684 of 7 June 2008 on i.a. Approval of the Professional Bachelor Study Programme
- Ministerial Order No. 714 of 27 June 2012 on Tests and Examinations in Professionally-oriented Higher Education Programmes.

Rules and regulations for students (see Blackboard and the Student Portal)

On Blackboard and on the Student Portal, students can find information about the rules laid down in the ministerial order as well as guidelines on examinations, etc.

Engineering placement

The engineering placement is described further in the course description (available on Blackboard) and the contract form is available on the Student Portal.

Course catalogue

The course catalogue provides descriptions of courses offered at AU Herning, including contents, criteria for achieving objectives and type of examination, etc. For a list of the courses offered at Aarhus University, School of Engineering, click here (in Danish).

Study overview (see Appendix 1)

The study overview contains a list of the courses in each semester.

Application procedure for specialisation

Final project

See the course description for more information about the final project (available on Blackboard).

Appendix 1: Brief overview of the Electronic Design Engineer study programme

<table>
<tr><th>1st semester</th><th>2nd semester</th><th>3rd semester</th><th>4th semester</th><th>5th semester</th><th>6th semester</th><th>7th semester</th></tr>
<tr><td>PRO1
Project 1
5 ECTS</td><td>PRO2
Project 2
5 ECTS</td><td>PRO3
Project 3
5 ECTS</td><td>PRO4
Project 4
5 ECTS</td><td>PRO5
Project 5
(company project)
10 ECTS</td><td rowspan="5">PLA1
Placement
30 ECTS</td><td rowspan="4">FPR1
Final Project
25 ECTS</td></tr>
<tr><td>BSD1
Basic Software Development 1
5 ECTS</td><td>BSD2
Basic Software Development 2
5 ECTS</td><td rowspan="2">ESY1
Embedded Systems 1
Systems engineering
Low- and high-level software design
10 ECTS</td><td rowspan="2">ESY2
Embedded Systems 2
Digital hardware design
Device drivers
10 ECTS</td><td>Elective
5 ECTS</td></tr>
<tr><td>DEL1
Digital Electronics 1
5 ECTS</td><td>DEL2
Digital Electronics 2
5 ECTS</td><td>Elective
5 ECTS</td></tr>
<tr><td>ECA1
Electric Circuit Analysis 1
5 ECTS</td><td>ANA1
Analogue Electronics 1
5 ECTS</td><td>ANA2
Analogue Electronics 2
5 ECTS</td><td>DSE1
Dynamic Systems and EMC 1
5 ECTS</td><td>Elective
5 ECTS</td><td rowspan="2">Elective
5 ECTS</td></tr>
<tr><td rowspan="2">APS1
Applied Science 1
Mathematics
Physics
10 ECTS</td><td rowspan="2">APS2
Applied Science 2
Mathematics
Circuit analysis
Physics
10 ECTS</td><td>SWE1
Software Engineering 1
5 ECTS</td><td>IDES1
Interaction Design for Embedded Systems 1
5 ECTS</td><td>Elective
5 ECTS</td></tr>
<tr><td>DSP1
Digital Signal Processing 1
5 ECTS</td><td>DSP2
Digital Signal Processing 2
5 ECTS</td><td>TOS1
Theory of Science 1
5 ECTS</td><td>Elective
5 ECTS</td></tr>
</table>

Appendix 2: Detailed overview of the Electronic Design Engineer study programme

Compulsory courses, 1st semester									
Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Project 1 (EPRO1)	5	Approval procedure	Reexamination in February	Approved/Not approved	Internal examiner	Q1 + Q2	Providing knowledge and practise teamwork: Teamwork skills; Teamwork psychology; Project planning; User requirements; User needs; Prototyping; Presentation techniques; How to write a report. - Method: Elements from the PreProject phase of the EUDP development method are applied in Project 1. - The project: The lecturers in Basic Software Design 1, Digital Electronics 1 and Electrical Circuit Analysis 1 will define the project in a way that includes elements from all the three embedded courses to be applied in the project. The topic is sustainability. - Environment: Life cycle analysis; WEEE; Sustainability; Renewable energy; Transportation; Wind turbines; Solar panels and heat exchange.	Lectures, self-study and project work	The admission requirements to the EDE study programme.
Basic Software Development 1 (EBSD1)	5	Approval procedure	Reexamination in February	Approved/Not approved	Internal examiner	Q1 + Q2	Setting up the fundamental tools for programming: IDE (Interactive Development Environment), debugger, compiler, linker, etc.; Basic programming in C++; Variables and data types; Program control statements; Arrays and strings; Functions; Introduction to classes and objects.	Lessons, self-study and project work	The admission requirements to the EDE study programme.
Digital Electronics 1	5	Approval procedure	Reexamination in February	The Danish 7-step scale	Internal examiner	Q1 + Q2	Number systems, operations and codes; Logic gates; Boolean algebra	Lessons, self-study and	The admission

(EDEL1)							and simplification; Combinatorial logic analyses; Functions of combinatorial logic; Latches, Flip-flops and timers; Memory and storage; Programmable logic – combinatorial PLDs and FPGAs.	project work	requirements to the EDE study programme.
Electric Circuit Analysis 1 (EECA1)	5	Written	Reexamination in February	The Danish 7-step scale	Internal examiner	Q1 + Q2	Ohm's law, Kirchhoff's laws, equivalent circuits using Thevenin-Norton theorems, circuit solving techniques, such as nodal analysis, mesh analysis, superposition, first-order circuits, operational amplifiers, SPICE and circuit simulation methods.	Lessons, self-study and project work	The admission requirements to the EDE study programme.
Applied Science 1 (EAPS1)	10	Written	Reexamination in February	The Danish 7-step scale	Internal examiner	Q1 + Q2	Limits; L'Hôpital's Rule; Harmonic functions; Mean value; Root mean square value; Numerical integration; Matrices; Complex numbers; Polar coordinates; Sequences and series. Motion in two dimensions; Circular motion; Laws of motion; Energy, power; Conservation of energy; Momentum; Rotation; Angular momentum; Static equilibrium; Oscillations; and heat transfer.	Lessons, self-study and project work	The admission requirements to the EDE study programme.
Electronic Workshop Course 1 (EWSC1)	0	Approval procedure	-	Approved/Not approved	None	Q1 + Q2	Practical electronics	Project work	The admission requirements to the EDE study programme.
Electronic Workshop Course 2 (EWSC2)	0	Approval procedure	-	Approved/Not approved	None	Q1 + Q2	Practical electronics	Project work	The admission requirements to the EDE study programme.

Compulsory courses, 2nd semester									
Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Project 2 (EPRO2)	5	Approval procedure	Reexamination in August	Approved/Not approved	Internal examiner	Q3 + Q4	Innovative methods; Market analysing methods; Documentation; Risk analysis; Participatory design; Create a working embedded device; Usability test; Be able to make a convincing presentation of the idea.	Lectures, self-study and project work	EPRO1
Basic Software Development 2 (EBSD2)	5	Oral	Reexamination in August	The Danish 7-step scale	External examiner	Q3 + Q4	Basic programming in C++; Fundamentals of object-oriented programming; Classes and objects; Inheritance; polymorphism; Fundamentals of networks and operating systems; Basic analysis of time and memory usage for a program/process.	Lectures, self-study and project work	EBSD1
Digital Electronics 2 (EDEL2)	5	Oral	Reexamination in August	The Danish 7-step scale	Internal examiner	Q3 + Q4	Synthesisable VHDL language constructs; Test benches; FPGA architecture; Clocking and reset; Combinational circuits; Signal routing; Memory elements; Synchronous design principles; Components, signals and data types; Generics; Finite state machines; Analogue to digital conversion; and on-chip verification.		EDEL1
Analogue Electronics 1 (EANA1)	5	Oral	Reexamination in August	The Danish 7-step scale	Internal examiner	Q3 + Q4	Semiconductor theory; Diode circuits and applications; BJT DC analysis and small signal operation; Transistor application circuits; MOSFETS and applications, Solar panels theory and operation.		EECA1
Applied Science 2 (EAPS2)	10		Reexamination in August		External examiner	Q3 + Q4	The Laplace transform; Infinite series; Fourier series; The Fourier transform; Computer tools; Electric charge and		EAPS1

							electric fields; Magnetic fields; Semiconductors.		
Electronic Workshop Course 3 (EWSC3)	0	Approval procedure	-	Approved/Not approved	None	Q3 + Q4	Practical electronics	Project work	EWSC1, EWSC2

Compulsory courses, 3rd semester									
Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Project 3 (EPRO3)	5	Approval procedure	Reexamination in February	Approved/Not approved	Internal examiner	Q1 + Q2	A structured development method must be applied on a project. The theory taught in previous and current courses must be applied to the project.	Lectures, self-study and project work	2nd semester must be passed.
Embedded Systems 1 (EESY1)	10	Oral	Reexamination in February	The Danish 7-step scale	Internal examiner	Q1 + Q2	EUDP (Embedded Unified Development Process); The process of interaction design; UML notation; Platform architecture design; Advanced object-oriented programming (C++); Programming for the embedded world (C); Establishing the embedded software platform; Basic microcontroller design; Interfaces and interaction for embedded systems; Semiconductor theory; Diodes; Transistors; Operational amplifiers; Applied circuit theory; Prototyping.	Lectures, self-study and project work	EBSD2 and EDEL2 must be passed.
Analogue Electronics 2 (EANA2)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Frequency response analysis and filter design; Active and passive filters; Operational amplifier: realistic behaviour and limitations; Power amplifiers - class A, B and AB; Oscillator circuits and applications.		EANA1 must be passed.
Software Engineering 1 (ESWE1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Revision control systems: Background; Setup; Usage Write reliable code: Debugging (local debugging and remote debugging using gdbserver); Code optimisation (use the compiler options, lint and profiling); SW test		EBSD2 must be passed.

							(equivalent classes, BlackBox, WhiteBox, integration); Continuous integration; and coverage Virtualisation Handling errors from the student's development utilities: Understand the transformation from source to executable. Databases: Install; Configure; Maintain; Use.		
Digital Signal Processing 1 (EDSP1)	5	Oral	Reexamina-tion in February	The Danish 7-step scale	Internal examiner	Q1 + Q2	Discrete-time signals and systems; Sampling of continuous time signals; The discrete Fourier transform (DFT); Time and frequency domain analysis of linear systems; Finite impulse response (FIR) filters; Infinite impulse response (IIR) filters, MATLAB®.	Lectures, self-study and exercises	EAPS2 must be passed.

Compulsory courses, 4th semester									
Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Project 4 (EPRO4)	5	Oral	Reexamination in August	The Danish 7-step scale	Internal examiner	Q3 + Q4	A structured development method must be applied on a project. The theory taught in the 4th semester must be applied on the project: EMC; Basic HW/SW co-design; Knowledge of ARM7 bus structure; Knowledge of ARM7 external memory controller; Ability to analyse, specify and implement CPU interface for ARM7 in an FPGA; IP cores; RTL simulation; The Wishbone SoPC interconnect; Design and implementation of a Wishbone compatible slave.	Project work and presentations, self-study and lectures	EPRO3 must be passed.
Embedded Systems 2 (EESY2)	10	Oral	Reexamination in August	The Danish 7-step scale	External examiner	Q3 + Q4	An overview of the hardware and software integration in the hardware driver; An overview of the architecture of embedded systems; Knowledge about how to programme a hardware driver; Handling concurrency in embedded drivers; Memory handling in kernel space; Understanding the situation in which the program is when designing and implementing software in the most central parts of an operating system; General knowledge about operating systems exemplified with the Linux kernel; EUDP; Static and dynamic optimisation of the code; Basic control theory; Prototyping; advanced microcontroller design – includes	Lectures, self-study and project work	EESY1 must be passed.

							microcontroller systems design, effective embedded system design using integrated software environment and embedded development tools; Interfacing off-chip peripherals; Memory bus timing; Wishbone SoPC for advanced FPGA peripheral design; Bus Functional Models for HDL verification; RFID design.		
Dynamic Systems and EMC 1 (EDSE1)	5	Oral	Reexamination in August	The Danish 7-step scale	External examiner	Q3 + Q4	Introduction to control systems; Modelling of dynamic systems using physical laws and experimental data; Transient and steady state response analysis; First analysis of feedback; Stability; Steady state error; Sensitivity and disturbance rejection; Control strategies; Introduction to proportional, integral and derivative control; MATLAB and Simulink for modelling and simulation; Noise sources and noise victims; Correct EMC design methods; EMC components, shielding and filtering; EMC legislation in the EU; Review technique.		EANA2 must be passed.
Interaction Design for Embedded Systems 1 (EIDES1)	5	Oral	Reexamination in August	The Danish 7-step scale	External examiner	Q3 + Q4	Embedded systems; Interaction design; Users interaction with physical devices; User experience design		2nd semester must be passed.
Digital Signal Processing 2 (EDSP2)	5	Oral	Reexamination in August	The Danish 7-step scale	External examiner	Q3 + Q4	The Fast Fourier Transform (FFT); Finite precision issues; Digital filter design (FIR and IIR); Spectral analysis; Averaging in the frequency domain; Stochastic signals; Real-time digital signal processing on fixed-point	Lessons, self-study and exercises	EDSP1 must be passed.

							processor.		
Compulsory courses, 5th semester									
Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Project 5 (EPRO5)	10	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	A project from the industry must be developed using engineering methods.	Project work	All 1st to 4th semester courses must be passed.
Theory of Science 1 (ETOS1)	5	Oral	Reexamination in February	The Danish 7-step scale	Internal examiner	Q1 + Q2	The concept of science; scientific paradigms; research methodology	Lessons, self-study and exercises	All 1st to 4th semester courses must be passed.

Compulsory courses, 6th semester									
Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Placement (EPLA)	30	Approval procedure	A new placement must be done.	Approved/Not approved	None	Q3 + Q4	Placement using engineering methods.	-	EPRO5 must be passed. At least two third year courses from must be passed. The placement company must be approved by Aarhus University, School of Engineering.

Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Final Project (EFPR)	25	Oral	Write a new project.	The Danish 7-step scale	External examiner	-	Project work using engineering methods.	Project work	Min. 150 ECTS must be passed, excl. the placement.

Electives, 5th and 7th semester									
Course name	**ECTS credits**	**Type of examination**	**Second examination attempt**	**Assessment**	**Marking**	**Quarter (1Q, 2Q, 3Q, 4Q)**	**Contents**	**Working methods**	**Prerequisites**
Control Systems 1 (ECSY1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1	Control Systems 1[1]	Lectures, self-study and project work	EDSE1 must be passed.
Control Systems 1 and 2 (ECSY1 and 2)	10	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Control Systems1 and 2[1]	Lectures, self-study and project work	EDSE1 must be passed.
Advanced Software Development 1 (EASD1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1	Advanced Software Design 1[1]	Lectures, self-study and project work	EESY2 and ESWE1 must be passed.
Advanced Software Development 1 and 2 (EASD1 and 2)	10	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Advanced Software Design 1 and 2[1]	Lectures, self-study and project work	EESY2 and ESWE1 must be passed.
Analogue Design Techniques 1 (EADT1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Analogue Design Techniques 1[1]	Lectures, self-study and project work	EDSE1 must be passed.
Switched Power Circuits 1 (ESPC1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Switched Power Circuits 1[1]	Lectures, self-study and project work	EDSE1 must be passed.
Digital Signal Processing 3 (EDSP3)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Digital Signal Processing 3, (adaptive filters)[1]	Lectures, self-study and project work	EDSP2 must be passed.
Digital Signal Processing 4 (EDSP4)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Digital Signal Processing 4 (video configurations)[1]	Lectures, self-study and project work	EDSP2 must be passed.
Communication and Media Technology 1 (ECMT1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Communication and Media Technology 1[1]	Lectures, self-study and project work	EESY2 and EDSE1 must be passed.
Advanced Digital Design 1 (EADD1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Advanced Digital Design 1[1]	Lectures, self-study and project work	EESY2 must be passed.
Distributed Systems 1 (EDIS1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Distributed Systems[1]	Lectures, self-study and project work	EESY2 must be passed.

Design With Video 1 (EDWV1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2		Lectures, self-study and project work	
Interaction Design 1 (EIDE1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Interaction Design, Design With Video[1]	Lectures, self-study and project work	EIDES1 must be passed.
Programming Mobile Devices 1 (EPMD1)	5	Oral	Reexamination in February	The Danish 7-step scale	External examiner	Q1 + Q2	Programming Mobile Devices 1[1]	Lectures, self-study and project work	EESY2, ESWE1 and EIDES1 must be passed.
ETALA: Applied Linear Algebra (ASE course)	5	See ETALA-01	See ETALA-01	See ETALA-01	See ETALA-01	See ETALA-01	See ETALA-01	See ETALA-01	
ETSMP: Stochastic Modelling and Processing (ASE course)	5	See ETSMP-01	See ETSMP-01	See ETSMP-01	See ETSMP-01	See ETSMP-01	See ETSMP-01	See ETSMP-01	

Please note: More courses will be added six months before the courses are offered.
[1]The full content will be added six months before the course is offered.