# Eksamensbevis - Diplomingeniør i Elektroteknik

# Claus Stovgaard

Marts 2008

Bachelor of engineering (B.Eng.)

Komplet version.



# Claus Jannik Helmann Stovgaard

Cpr.nr/Civil reg.no. 210984-

har den/ has on the 15. januar 2008

Bestået/ passed

# Diplomingeniør i Elektroteknik

Bachelor of Electrical, Electronic and Computer Engineering

og har dermed ret til at betegne sig and has thus been awarded the title of

Bachelor of Engineering (B.Eng.)

Odense, den 26. januar 2008

Per Michael Johansen

( Va Michael)

Dean

Syddansk Universitet University of Southern Denmark Henning Andersen

**U**ddannelsesdirektør

Director of Studies

Syddansk Universitet University of Southern Denmark

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210984-

Karakter/Mark/Grade 7-skala 13-skala ECTS ECTS Points

Vægt Credit factor

# DIPLOMINGENIØR I ELEKTROTEKNIK MED SPECIALISERING I DATATEKNIK

BACHELOR OF ELECTRICAL, ELECTRONIC AND COMPUTER ENGINEERING WITH SPECIALISATION IN COMPUTER ENGINEERING.

### OBLIGATORISK DEL

CORE PART

ANALOGIER, MODELLERING OG SIMULERING 1 ANALOGIES, MODELLING AND SIMULATION 1 Mundtlig, intern censur Oral exam, Internal examiner	10	10	В	20,0
TEORETISKE OG EKSPERIMENTELLE UNDERSØGELSER 1	Bestået	Bestået		10,0
THEORETICAL AND EXPERIMENTAL RESEARCH 1	Passed	Passed		
Løbende evaluering, intern censur  Continous evaluation, Internal examiner				
INDLEJREDE SYSTEMER 1	12	11	Α	9,0
EMBEDDED SYSTEMS 1				
Mundtlig, intern censur  Oral exam, Internal examiner				
ELEKTROMAGNETISME OG ANALOG SIGNAL BEHANDLING	7	9	C	30,0
ELECTROMAGNETISM AND ANALOG SIGNAL PROCESSING				
Mundtlig, ekstern censur				
Oral exam, External examiner				
MEKATRONIK 1	10	10	В	9,0
MECHATRONIC 1				
Løbende evaluering, intern censur				
Continous evaluation, Internal examiner				

SYDDANSK UNIVERSITET UNIVERSITY OF SOUTHERN DENMARK

210984-	Karakter/Mark/Grade 7-skala 13-skala ECTS				Vægt Credit factor	
	, -onara	10 Shaid	2010	Points		
PROJEKT 2	12	11	Α	12,0		
PROJECT 2						
Projekt og mundtligt forsvar, ekstern censur Project and oral defence, External examiner						
TILVALGSDEL						
ELECTIVE UNITS						
DESIGN OG KONSTRUKTION AF ROBOTKØRETØJ	Bestået	Beståe	t	7,5		
DESIGN AND IMPLEMENTATION OF ROBOTIC VEHICLES	Passed	Passed	l			
Mundtlig, ekstern censur Oral exam, External examiner						
COMPUTERARKITEKTUR	Bestået	Beståe	t	5,0		
COMPUTER ARCHITECTURE	Passed	Passed	l			
Mundtlig, ekstern censur Oral exam, External examiner						
DIGITALTEKNIK OG PROGRAMMERING	10	10	В	5,0		
DIGITAL ELECTRONICS 2 AND PROGRAMMING						
Mundtlig, ekstern censur Oral exam, External examiner						
DATAKOMMUNIKATION	7	8	С	5,0		
COMPUTER NETWORKS						
Mundtlig, ekstern censur						
Oral exam, External examiner						
MATEMATIK	4	7	D	6,0		
MATHEMATICS						
Skriftlig, ekstern censur						
Written exam, External examiner						
REGULERINGSTEKNIK, EFFEKTELEKTRONIK, DATAKONVERTERING OG DIGITAL SIGNALBEHANDLING	7	9	C	15,0		
CONTROL ENGINEERING, POWER ELECTRONICS AND DIGITAL SIGNAL PROCESSING						
Mundtlig, ekstern censur Oral exam, External examiner						

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210	0984-		er/Mark/G 13-skala		ECTS Points	Vægt Credit factor
	DBJEKTORIENTERET SYSTEMUDVIKLING OG DESIGN DBJECT-ORIENTED SYSTEM ANALYSIS AND DESIGN		9	С	5,0	
	Mundtlig, ekstern censur Oral exam, External examiner					
	TRANSDUCER OG INTERFACETEKNIK TRANSDUCER AND INTERFACING	7	9	С	5,0	
	Aundtlig, ekstern censur Oral exam, External examiner					
P. M	PATA-PROJEKT ROJECT IN COMPUTER ENGINEERING Mundtlig, ekstern censur Pral exam, External examiner	7	9	С	5,0	
E	EMBEDDED C PROGRAMMERING PROGRAMMING IN C FOR EMBEDDED SYSTEMS	Godkendt Approved			5,0	
	Godkendelsesprocedure, ingen censur pproval procedure, Without second examiner					
	OPERATIVSYSTEMER OPERATING SYSTEMS	Bestået <i>Passed</i>	Beståe Passea		5,0	
	Godkendelsesprocedure, ingen censur pproval procedure, Without second examiner					
	FGANGSPROJEKT					
	NAL PROJECT					
A	FGANGSPROJEKT	10		В	30,0	
F	INAL PROJECT					
	rojekt Hejmdal					
	rojekt og mundtligt forsvar, ekstern censur Project Hejmdal					
_						

VÆRKSTEDSKURSUS WORKSHOP COURSE

Project and oral defence, External examiner

SYDDANSK UNIVERSITET UNIVERSITY OF SOUTHERN DENMARK

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Karakter/1 7-skala 1				ECTS Points	Vægt Credit factor
INSTALLATIONSTEKNIK	Godkendt	Godker	ıdt	2,0	
INSTALLATION AND WIRING	Approved	Approv	ed		
Godkendelse, ingen censur Approval, Without second examiner					
MEKANIK	Godkendt	Godker	ndt	2,0	
MECHANICAL WORKSHOP	Approved	Approv	ed		
Godkendelse, ingen censur Approval, Without second examiner					
PRINT, MÅLETEKNIK	Godkendt	Godker	ıdt	2,0	
MEASUREMENT	Approved	Approv	ed		
Godkendelse, ingen censur Approval, Without second examiner					
STRØMFORSYNING	Godkendt	Godker	ıdt	2,0	
POWER SUPPLIES	Approved	Approv	ed		
Godkendelse, ingen censur Approval, Without second examiner					
LODDETEKNIK, KOMPONENTLÆRE, FEJLFINDING	Godkendt	Godker	ıdt	2,0	
SOLDERING, FAULT FINDING	Approved	Approv	ed		
Godkendelse, ingen censur Approval, Without second examiner					

#### INGENIØRPRAKTIK

INDUSTRIAL ENGINEERING TRAINING

INICEN	MADDE	AIZTIZ
INGEN	IIØRPR	AKIIK

INDUSTRIAL ENGINEERING TRAINING

Godkendelsesprocedure, ingen censur Approval procedure, Without second examiner

Godkendt Godkendt

Approved Approved

30,0

210984-



Karakter/Mark/Grade 7-skala 13-skala ECTS ECTS Points

Vægt Credit factor

Studiet er normeret til 210 ECTS-point. Bemærk at den genererede sum af ECTS-points kan afvige fra den samlede sum på grund af afrunding.

The study is rated at 210 ECTS-points. Please notice that the rounded value of ECTS credits may differ from the actual value for a specific program.

Odense, den 26. januar 2008

Udskriftens rigtighed bekræftes Registrar's Office Navn Claus Jannik Helmann Stovgaard Cpr.nr. 210984-



# Kompetenceprofil for:

## Diplomingeniør i Elektroteknik

Diplomingeniøren kan selvstændigt tilegne sig og bearbejde viden på et bredt fagligt grundlag og med et anvendelsesorienteret sigte vurdere og nyttiggøre teknisk-videnskabelige forskningsresultater. Ingeniøren indgår konstruktivt og resultatorienteret på flere organisatoriske niveauer, er i stand til at løse opgaver, omfattende økonomiske, miljømæssige og etiske aspekter og har desuden forudsætninger for livslang læring inden for sit ingeniørfaglige område, herunder som led i videre uddannelse.

### Diplomingeniøruddannelsen i Elektronik

Dataingeniørens kompetencer ligger indenfor områderne: indlejrede systemer, industriel automation programmerbar elektronik og datakommunikation.

Dataingeniøren kan formidle teknisk viden, behersker grundlæggende teknikker og værktøjer indenfor programmerbar elektronik, kender et bredt udsnit af elektroniske komponenter, har et indgående kendskab til informationsoverførsel mellem fysiske og elektroniske/digitale systemer, kan anvende programmeringsteknikker, evner livslang læring, kan modellere og simulere systemer, kan integrere tekniske muligheder og samfundsmæssige behov i anvendelsesorienterede systemer.

Dataingeniørens kompetencer: Elektronik: (kredsløbsteknik, analog elektronik, digitalteknik, programmerbar logik, computerarkitektur), Programmering: (assembler, objektorienteret programmering, program- og datastrukturer, brugergrænseflader (GUI), multiprogrammering, numeriske metoder), Indlejrede systemer: (hardware-nær programmering, realtidsforhold, operativsystemer, datakommunikation, apparatteknik), Signalbehandling: (reguleringsteknik, signalbehandling, ledningsteori).

Odense, den 26. januar 2008

Udskriftens rigtighed bekræftes

Kun gyldig i original med universitetets prægestempel

Name Claus Jannik Helmann Stovgaard Civil reg. No. 210984-



# Qualification profile for:

## Bachelor of Electrical, Electronic and Computer Engineering

The B.Eng. can independently acquire and analyse knowledge on a broad academic basis and assess and utilise technical and scientific research results with an application-oriented approach. The engineer participates constructively and results-oriented on several organisational levels, is able to solve tasks involving extensive financial, environmental and ethic aspects, and is qualified for lifelong learning in his or her field of engineering.

## Bachelor of Engineering in Electrical, Electronic and Computer Engineering

A Bachelor in Computer Engineering has competences in embedded systems, industrial automation, programmable electronics and data communication.

The computer engineer is able to communicate technical knowledge, master basic techniques and tools in programmable electronics, is familiar with a wide selection of electronic components, has a thorough knowledge of information transfer between physical and electronic/digital systems, is qualified for lifelong learning, can use programming techniques, model and simulate systems and integrate technical possibilities and social needs in user-oriented systems.

Competences include electronics (circuit technologies, analogue electronics and digital design, programmable electronics, computer architecture), programming (assembler, object-oriented programming, programme and data structures, user interfaces (GUI), multiprogramming, numerical methods), embedded systems (hardware programming, real-time conditions, operating systems, data communication, electro-mechanic design), signal processing (control theory, signal processing, transmission lines).

Odense, den 26. januar 2008

Registrar's Office

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# Diploma Supplement

This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.) It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgements, equivalence statements or suggestions about, an explanation should give the reason why.

#### 1. Holder of Qualification

1.1 Family name(s):

Stovgaard

1.2 Given name(s):

Claus Jannik Helmann

1.3 Date of birth:

21 September 1984

1.4 Civil registration number 210984-1997

### 2. Qualification

#### 2.1 Name of qualification and title conferred

B.Eng. (Bachelor of Engineering)

#### 2.2 Main fields of study

Natural Science, Mechanics, Electrophysics, Electronics, EDP. Specialisation in Power Engineering, Electronic Engineering or Computer Engineering.

#### 2.3 Name and status of awarding institution

Syddansk Universitet/University of Southern Denmark. The University of Southern Denmark is a state-recognised and state-financed higher education institution, regulated according to the Ministry of Research University Act of May 28th 2003.

#### 2.4 Name and status of institution administering the study

Not applicable.

#### 2.5 Language(s) of instruction/examination

Danish and English

#### 3. Level of Qualifications

#### 3.1 Level of qualifications

A medium cycle professional HE qualification normally requiring a total of 3½ years of full-time higher education studies including 6 months' industrial engineering training in either a domestic or foreign company.

#### 3.2 Official length of programme

31/2-year B.Sc. = 210 ECTS credit points.

Acceptance to the Bachelor of Electrical, Electronic and Computer Engineering requires a completed upper secondary school leaving examination or comparable qualifications. In addition to this, acceptance also depends on a high level in the subjects Mathematics, Physics and Chemistry.



#### 4. Contents and Results Gained

#### 4.1 Mode of study

Full time study programme, equivalent of 210 ECTS credit points

#### 4.2 Aim of programme

The programme aims to educate engineers of high quality. The graduates are able to combine research, science, technology, management and practical implementation in their career. During the first three semesters all students study basic units such as Mathematics, Physics, Mechanics, Electrophysics, Electronics and EDP. In the fourth semester students begin to specialise in one of the three major areas: Power Engineering, Electronic Engineering or Computer Engineering. The students spend their fifth semester in industrial engineering training. During the sixth and seventh semester, the students choose course units for final \*specialisation within their major area and they carry out their final dissertation.

#### 4.3 Programme details and individual grades/marks/credits obtained

Please refer to the grade transcript in the diploma.

#### 4.4 Grading scheme and if applicable grade distribution information

Please refer to the explanatory grading scale.

#### 4.5 Overall classification of the qualification, i.e. honours degree, first class etc

Not applicable for Danish qualifications.

#### 5. The applicability of the Qualification?

#### 5.1 Access to further study

A Bachelor of Electrical, Electronic and Computer Engineering gives general access to M.Sc. studies. Specific admission is subject to approval by the institution.

#### 5.2 Professional status

The Bachelor of Engineering qualifies the candidate for handling - nationally and internationally - industrial functions, where technical research achievements in combination with other sciences are converted to practical application by solving consultancy, development and operational problems. Apart from this, the education enables the candidates to impart technically complicated problems to persons with a different academic and cultural background, and enter into interdisciplinary collaboration with management relations.

#### 6. Additional Information

#### 6.1 For further information

Information in English on the University of Southern Denmark (study programmes, contents of the programmes, research, faculties and departments) is available at the University's website www.sdu.dk or from the Registrar's Office, Campusvej 55, 5230 Odense M, phone +45 65 50 10 00, e-mail: studie@sdu.dk. General information on higher education in Denmark can be obtained from The Danish Ministry of Education at www.uvm.dk, The Ministry of Science, Technology and Innovation at www.vtu.dk or from The Danish Rectors Conference at www.rks.dk.

#### 6.2 Institutional information

University of Southern Denmark is a research-based university founded in 1998. University of Southern Denmark is a merger of the former Odense University, Southern Denmark School of Business and Engineering and the South Jutland University Centre. In 2006 the university merged with the Odense University College of Engineering. The university now enrols more than 15000 full time students (bachelor and master programmes), more than 3500 part time students and more than 450 Ph.D. students. These figures do not include more than 1000 foreign students and exchange students. The university has a staff of approximately 2500 full-time equivalents. More than 1100 are researchers as well as part of the teaching staff. The University of Southern Denmark has five faculties - the Faculty of Humanities, the Faculty of Social Sciences, the Faculty of Science and the Faculty of Engineering.

The university has been awarded the Diploma Supplement Label.

The University of Southern Denmark strives to be an international orientated university with a strong local commitment and is based in four local campuses in the region. The main campus is situated in Odense. The university has a long tradition for strong research based education at bachelor and master level, but also focuses on continuing education and do



offer a number of summer courses every year, presenting the latest research. In addition, the university has an extensive Open University department offering part time courses, specially designed programmes and applied courses.

At the University of Southern Denmark basic as well as applied research are given high priority. Funding comes from the Government, from Danish and international research funds and from co-operation with business corporations, local authorities and municipalities.

### 7. Certification of the Supplement

University of Southern Denmark, 26 January 2008

Registrar's Office





# Karakterskala for eksaminer bedømt før 1. september 2007

Karakterskala (13-skala)

- For den usædvanlig selvstændige og udmærkede præsentation.
- 11: For den udmærkede og selvstændige præsentation.
- For den udmærkede, men noget rutineprægede præsentation.
- For den gode præsentation, der ligger lidt over middel.
- 8: For den middelgode præsentation.
- For den ret jævne præsentation, der ligger lidt under middel.
- 6: For den netop acceptable præsentation.
- 5: For den usikre og ikke tilfredsstillende præsentation
- 03: For den meget usikre, meget mangelfulde og utilfredsstillende præsentation.
- 00: For den helt uantagelige præsentation

# Grading scale for examinations assessed before september 1th, 2007

The grading scale (13-point scale)

- 13: is given for the exceptionally independent and excellent performance \*)
- 11: is given for the independent and excellent performance
- 10: is given for the excellent but not particularly independent performance
- 9: is given for the good performance, a little above average
- 8: is given for the average performance
- 7: is given for the mediocre performance, sligthly below average
- 6: is given for the just acceptable performance
- 5: is given for the hesitant and not satisfactory performance
- 03: is given for the very hesitant, very insufficient and unsatisfactory performance
- 00: is given for the completely unacceptable performance
- \*) The grade 13 is used very seldom and then only for an extraordinary performance

## Konverteringsskala/conversions scale

13-skala / 13 point scale	13	11	10	9	8	7	6	5	03	00
7-trins skala / 7 point scale	12	12	10	7	7	4	02	00	00	-3



# The Danish Higher Education System

This description has been approved by the Danish Ministry of Education, the Ministry of Science, Technology and Innovation and the Ministry of Culture.

#### Admission to higher education

General access to higher education in Denmark requires 12 years of education, including one of the following secondary school leaving examinations or comparable qualifications:

- studentereksamen (Upper Secondary School Leaving Examination);
- højere forberedelseseksamen (hf) (Higher Preparatory Examination);
- højere handelseksamen (hhx) (Higher Commercial Examination);
- højere teknisk eksamen (htx) (Higher Technical Examination).

Admission to many degree programmes depends also on the fulfilment of specific requirements such as subject combinations, the level of subjects taken, the grades obtained, work experience, etc. A few programmes have limited enrolment.

Admission to certain programmes requires an entrance examination or submission of a portfolio of artistic work.

#### Higher education institutions

Institutions can be grouped into four different types:

- Research universities (*Universitet*) offering undergraduate and postgraduate degree programmes in all academic disciplines.
- University-level institutions offering undergraduate and postgraduate degree programmes in subject fields such as architecture, design, music and fine and performing arts.
- University colleges (CVU/Professionshøjskole) and a few specialized colleges offering 3-4-year professionally oriented undergraduate degree programmes.
- Academies of Professional Higher Education (Erhvervsakademi) offering 2-year professionally oriented undergraduate degree programmes.

#### Accreditation

Public higher education institutions are publicly financed, and they must follow the national legislation concerning e.g. degree structures, teacher qualifications and examinations, including a system of external examiners. A nationally established – fully independent – accreditation agency assures the quality and the relevance of higher education programmes.

*Private institutions* can operate without any approval. However, if students at private institutions are to be eligible for state study grants, the institutions must abide by a recognition procedure.

#### Undergraduate qualifications (first cycle degrees)

University Bachelor's degrees

The University Bachelor's degree is awarded after completion of a 3-year undergraduate programme (180 ECTS credits), normally concentrated on one or two fields of study. The programmes are research-based and provide students with a broad academic foundation as well as specialised knowledge combined with theoretical, applied and analytical skills. Students are required to submit a final project paper. The programmes qualify students for occupational functions and for postgraduate studies e.g. for the candidatus degree. The Danish title is BA or BSc + field of study.

#### Professional Bachelor's degree

The Professional Bachelor's degree is awarded after 3 to 4 years of study (180-240 ECTS credits). The programme provides students with knowledge of theory and the application of theory to professional practice. All programmes include periods of practical training and require the submission of a final project paper.

Most programmes give access to further studies in the same field, i.e. a master's programme (adult and continuing education) or, on certain conditions, a specific *candidatus* programme.

The Danish title is *professionsbachelor i . . . (+ subject field)* 

Bachelor degrees in architecture, design, music and fine and performing

The bachelor's degree is awarded after 3 to 4 years of study (180-240 ECTS credits). Most programmes are research-based and/or based on artistic professionalism and provide students with knowledge of theory, application of theory and professional practice. The programmes qualify students for occupational functions in the arts and for postgraduate studies e.g. for the *candidatus* degree.

#### Academy Profession degree

The Academy Profession degree (AP degree) is normally awarded after 2 years of study (120 ECTS credits). Admission is possible on the basis of either general upper secondary education or relevant vocational education and training supplemented by adequate general upper secondary courses (e.g. maths, physics, English). The programmes qualify students to perform practical, vocational tasks on an analytical basis. Apart from theoretical subjects, the programmes involve a final project. The Danish title includes the suffix AK.

#### Postgraduate qualifications

Candidatus(a) degree (second cycle degree)

The candidatus(a) degree is normally awarded after 2 years of study (120 ECTS credits) following a BA/BSc degree. The programme is research-based and provides the student with theoretical knowledge, analytical and scientific (and/or artistic) skills combined with the ability of practical application. The programme requires the preparation of a thesis (30-60 ECTS credits), or – in certain fields – an artistic project. It qualifies students for a professional career and scientific work. The Danish title is usually abbreviated to: Cand. + subject field. The English title is usually MA or MSc + subject field. The mag.art. degree is awarded in the humanities after 3 years of research-oriented studies (180 ECTS credits) following a BA.

#### Doctorate (third cycle degree)

The PhD (ph.d.) degree is normally awarded after 3 years of higher education and research (180 ECTS credits) following a candidatus degree. The PhD programme includes the preparation and public defence of a thesis.

Music Academies offer a specialist degree of 2 to 4 years following the *candidatus* degree.

#### Adult and continuing education

Adult education qualifications are available at levels corresponding to those of the ordinary higher education system.

- The VVU degree (videregående voksenuddannelse) is awarded after studies at Academy Profession level and gives access to diploma programmes;
- The diploma degree (diplomuddannelse) is awarded after studies at first cycle level and gives access to master's programmes;
- The master's degree (*masteruddannelse*) is awarded after studies at second cycle level.

The programmes normally consist of 2 years of part-time study, equivalent to 1 year of full-time study (60 ECTS credits). Certain master's programmes require 1½ years of full-time study (90 ECTS credits). Admission requirements are a relevant educational qualification and at least 2 years of relevant work experience.

#### Examinations and diplomas

All examinations at Danish higher education institutions are administered not only by the teacher, but also by an examiner who often is external. The examiners are responsible for assuring the same standard for all examinations and thus their quality. After completion of a full programme, the student is awarded a diploma and a transcript.

#### The 7-point grading scale

The grading system used in all state-regulated education as from August/September 2007 is the 7-point grading scale. The grading scale is compatible with the ECTS grading scale.

The	7-point grading scale	The ECTS grading scale
12	For an excellent performance displaying a high level of command of all aspects of the relevant material, with no or only a few minor weaknesses	A
10	For a very good performance displaying a high level of command of most aspects of the relevant material, with only minor weaknesses.	В
7	For a good performance displaying good command of the relevant material but also some weaknesses.	С
4	For a fair performance displaying some command of the relevant material but also some major weaknesses.	D
02	For a performance meeting only the minimum requirements for acceptance	E
00	For a performance which does not meet the minimum requirements for acceptance	Fx
-3	For a performance which is unacceptable in all respects	F

Apart from the 7-point grading scale, pass/fail assessment may also be used. 02 is the minimum grade for passing an exam.

The performance of the student must be assessed according to the academic targets set for the specific subject or course (absolute grading method). The relative grading method must not be used.

