Eksamensbevis - Civilingeniør i Robotteknologi

Claus Stovgaard

December 2010

Master of Science (M.Sc.)

Komplet version.

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

Claus Jannik Helmann Stovgaard

Cpr.nr/*Civil reg.no.* 210984-[redacted]

har den/
has on the 28. september 2010 Bestået/
passed

Civilingeniør i Robotteknologi

Master of Science in Robot System Engineering

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

Candidatus Polytechnices (Cand.Polyt.)

Syddansk Universitet, den 22. november 2010

Per Michael Johansen
Dekan
Dean
Syddansk Universitet
University of Southern Denmark

Henning Andersen
Uddannelsesdirektør
Director of Studies
Syddansk Universitet
University of Southern Denmark

Kun gyldig i original med universitetets prægestempel
This document is official only in the original, bearing the University's embossed stamp

Navn, *Name*
Claus Jannik Helmann Stovgaard
Cpr.nr., *Civil reg. No.*
210984-[redacted]

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

	Karakter/Mark/Grade 7-skala	13-skala	ECTS	ECTS Points	Vægt Credit factor
CIVILINGENIØR I ROBOTTEKNOLOGI MASTER OF SCIENCE IN ROBOT SYSTEM ENGINEERING					
MOTORKONTROLENHED ENGINE CONTROL UNIT Mundtlig prøve m udg i opga, intern censur *Mundtlig prøve m udg i opga, Internal examiner*	**10**			B	20,0
HØJHASTIGHEDSELEKTRONIK HIGH SPEED ELECTRONICS Mundtlig prøve - afl.opgave, intern censur *Oral examination - graded course work, Internal examiner*	7			C	5,0
ROB01, DIGITAL BILLEDBEHANDLING ROB01, IMAGE PROCESSING Projekt, ekstern censur *Project, External examiner*	12			A	5,0
ROB00, INTRODUKTION TIL ROBOTTEKNOLOGI ROB00, INTRODUCTION TO ROBOTICS Projekt, intern censur *Project, Internal examiner*	**Bestået** ***Passed***	Bestået *Passed*			5,0
AI00, FUNDAMENTET FOR KUNSTIG INTELLIGENS AI00, FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE Mundtlig, intern censur *Oral exam, Internal examiner*	**10**			B	5,0
ECA00, INTRODUKTION TIL INDLEJRET STYRING OG AUTOMATION ECA00, INTRODUCTION TO EMBEDDED CONTROL AND AUTOMATION Mundtlig, intern censur *Oral exam, Internal examiner*	12			A	5,0

Navn, *Name*
Claus Jannik Helmann Stovgaard
Cpr.nr., *Civil reg. No.*
210984-[redacted]

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

	Karakter/Mark/Grade 7-skala	13-skala	ECTS	ECTS Points	Vægt Credit factor
ADVANCED TOPICS IN SOFTWARE ENGINEERING	**Bestået** *Passed*	Bestået *Passed*		5,0	
Rapport, ingen censur *Written report, Without second examiner*					
VIDEREGÅENDE PROGRAMMERBAR ELEKTRONIK ADVANCED PROGRAMMABLE ELECTRONICS	7		C	5,0	
Rapport, intern censur *Written report, Internal examiner*					
HARDWARE/SOFTWARE CO-DESIGN HARDWARE / SOFTWARE CO DESIGN	12		A	5,0	
Mundtlig, ekstern censur *Oral exam, External examiner*					
MODELBASERET SOFTWARE MODEL BASED SOFTWARE	**10**		B	5,0	
Mundtlig, ekstern censur *Oral exam, External examiner*					
REALTIDS SYSTEMER REAL-TIME SYSTEMS	**10**		B	5,0	
Mundtlig, ekstern censur *Oral exam, External examiner*					
SSE/SSEP06: PERVASIVE AND UBIQUITOUS SYSTEMS	**Bestået** *Passed*	Bestået *Passed*		5,0	
Rapport, intern censur *Written report, Internal examiner*					
INDIVIDUEL FORK, FORUNDERSØGELSE TIL SPECIALET INDIVIDUAL PRELIMINARY INVESTIGATION OF THE THESIS PROBLEM DOMAIN	7		C	15,0	
Mundtlig, intern censur *Oral exam, Internal examiner*					
SPECIALE I DATATEKNOLOGI THESIS IN SYSTEM ENGINEERING	**10**		B	30,0	
Specialerapport, ekstern censur *Thesis, External examiner*					

Navn, *Name*
Claus Jannik Helmann Stovgaard
Cpr.nr., *Civil reg. No.*
210984-[redacted]

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

Karakter/Mark/Grade		ECTS	Vægt
7-skala	13-skala	ECTS Points	Credit factor

Adgangsgivende eksamen: Højere teknisk eksamen (HTX 3-årig)
Entrance qualifications: Higher Technical Examination (HTX 3 years)

Studiet er normeret til 120 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 120 ECTS-points. Please notice that the rounded value of ECTS credits may differ from the actual value for a specific program.

Syddansk Universitet, den 22. november 2010

Udskriftens rigtighed bekræftes
Registrar's Office

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

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 recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1.Information Identifying the Holder of the 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 Student identification number: 210984-[redacted]

2. Information Identifying the Qualification

2.1 Name of qualification and title conferred

Master of Science in Robot System Engineering (Civilingeniør i Robotteknologi)

2.2 Main fields of study for the qualification

Robot Systems 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 Science, Technology and Innovation University Act of May 28th 2003 plus amendments.

2.4 Name and status of institution administering the studies

Not applicable.

2.5 Language(s) of instruction/examination

Danish and English

3. Information on the Level of the Qualification

3.1 Level of qualification

A long cycle research based qualification - normally requiring 5 years of full time higher education studies (3-year B.Sc. + 2-year M.Sc.).

3.2 Official length of programme

2-year Master og Science. = 120 ECTS credit points.

3.3 Access requirements

Acceptance to the M.A./M.Sc. requires a completed B.A./B.Sc.

4. Information on the Contents and Results Gained

4.1 Mode of study

Full time study programme, equivalent of 120 ECTS credit points

4.2 Programme Requirements

The programme leading to the degree of Master of Science in Engineering qualifies students for independently to fulfill vocational functions both nationally and internationally within their field of study.

The programme qualifies students for

-the ability to use scientific methods within the area of science and engineering and the implementation of engineering innovation and research
-the ability to solve complex engineering problems through the use of scientific and technological knowledge
-participation in the planning, realization and management of complex technological systems including the involvement of social, economic and environmental consequences in the solving of technological problems and
-the ability to enter into cooperation with people of different educational and cultural background.

The 5-year programme is concluded with a Master Thesis Project with a weight of 60 ECTS-points.
The 2-year programme is concluded with a Master Thesis Project with a weight of 30 ECTS-points.

The Master Thesis Project is an independent experimental empirical and/or theoretical study of one or more problems in association with the core subjects of Engineering.

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

Please refer to the grade transcript in the diploma.

4.4 Grading scheme and, if available, grade distribution guidance

Please refer to the explanatory grading scale.

4.5 Overall classification of the qualification

Not applicable for Danish qualifications.

5. Information on the Function of the Qualification

5.1 Access to further study

A completed Master of Science gives access to the Ph.D. programme

5.2 Professional status

The programme leading to the Master of Science qualifies students for the ability independently to fulfill vocational functions both nationally and internationally within the area of natural science and at the same time it gives the students an insight into theoretical and experimental scientific methods and it qualifies the students for participation in scientific innovation and development.

6. Additional Information

6.1 Additional 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 Further information sources

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, the South Jutland University Centre and Odense University College of Engineering. In 2007 the university merged with HHC Business School Centre. The university now enrols more than 15000 full time students (bachelor and master programmes), more

than 4500 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 Health Sciences, the Faculty of Science and the Faculty of Engineering.

The University of Southern Denmark strives to be an international orientated university with a strong local commitment and is based in five 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, 22 November 2010

Registrar's Office

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

Name
Claus Jannik Helmann Stovgaard
Civil reg. No.
210984-[redacted]

Qualification profile for:

Master of Science in Robot System Engineering

The Master of Science in Engineering can, on a technical-scientific basis, solve complex engineering tasks that necessitate knowledge of advanced theory and methods in the relevant field. Thus, the Master of Science in Engineering can perform more specialised functions, including participation in scientific development work. Moreover, the education qualifies for PhD studies.

Master of Science in Robot Systems Engineering

Competence Profile for the Master of Science in Computer Engineering Specialised in Robotics
The M.Sc.(Eng) in Computer Engineering specialised in Robotics has supplemented interdisciplinary competences in computer engineering with advanced competences in robotics.
Computer Engineering is a multidisciplinary engineering programme aimed at job functions in which an extensive academic knowledge of the interaction between technology and society is crucial. Computer engineers are primarily employed for development projects in production and consultancy companies.
The graduate gains the most important competences in advanced robotic systems for industry and service. This includes general competences such as computer vision and simulation and modelling of complex physical systems as well as specific competences such as automatic programming of collision-free robot motions. Moreover, the graduate has the opportunity to participate in cooperation projects with the business sector.
Besides robotics, the gained competences may be applied in a number of other places such as in the development of computer games and facial recognition, among other things used in the fight against terror.

Syddansk Universitet, den 22. november 2010

Registrar's Office

This document is official only in the original, bearing the University's embossed stamp

Navn
Claus Jannik Helmann Stovgaard
Cpr.nr.
210984-[redacted]

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

Kompetenceprofil for:

Civilingeniør i Robotteknologi

Civilingeniøren kan på et teknisk-videnskabeligt grundlag løse komplekse ingeniørfaglige opgaver, som kræver indsigt i avanceret teori og metode inden for det pågældende fagområde. Civilingeniøren kan dermed bestride mere specialiserede erhvervsfunktioner, herunder deltage i videnskabeligt udviklingsarbejde, ligesom uddannelsen kvalificerer til ph.d. uddannelsen.

Kandidatuddannelse (120 ECTS) i Robotteknologi

Kompetenceprofil for Datateknologi kandidat med speciale i robotteknologi
Datateknologi-kandidaten med speciale i robotteknologi har suppleret sine tværfaglige datateknologiske kompetencer med avancerede kompetencer indenfor robotteknologi.
Datateknologi er en multidisciplinær ingeniøruddannelse, der sigter mod jobfunktioner, hvor en stor faglig viden om teknologiens samspil med omgivelserne er af afgørende betydning for succes. Kandidater ansættes primært til udviklingsopgaver i udviklingstunge produktionsvirksomheder og konsulentvirksomheder.
Kandidaten opnår de væsentligste faglige kompetencer indenfor avancerede robotsystemer til industri og service. Dette omhandler generelle kompetencer såsom computer vision og simulering og modellering af komplekse fysiske systemer, samt specifikke kompetencer såsom automatisk programmering af kollisionsfri robotbevægelser.
Udover til robotteknologi kan de opnåede kompetencer indgå i en række andre anvendelser såsom udvikling af computerspil og ansigtsgenkendelse til f.eks. terrorbekæmpelse.

Syddansk Universitet, den 22. november 2010

Udskriftens rigtighed bekræftes

Kun gyldig i original med universitetets prægestempel

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

Karakterskala for eksaminer bedømt før 1. september 2007

Karakterskala (13-skala)

13: For den usædvanlig selvstændige og udmærkede præsentation.

11: For den udmærkede og selvstændige præsentation.

10: For den udmærkede, men noget rutineprægede præsentation.

9: For den gode præsentation, der ligger lidt over middel.

8: For den middelgode præsentation.

7: 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

SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

The Danish Higher Education System

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

Public higher education institutions in Denmark are governed by national legislation concerning degree structures, teacher qualifications and examinations. All programmes are accredited by national, independent accreditation agencies and the Accreditation Council.

Higher education institutions

Higher education is offered by four types of higher education institutions and regulated by three Ministries:

- Academies of Professional Higher Education (*Erhvervsakademi*) and University Colleges (*Professionshøjskole*) are regulated by the Ministry of Education and offer professionally oriented first cycle degree programmes.
- Research universities *(Universitet)* are regulated by the Ministry of Science, Technology and Innovation and offer first, second and third cycle degree programmes in all academic disciplines.
- A number of university level institutions are regulated by the Ministry of Culture and offer first, second and third cycle degree programmes in subject fields such as architecture, design, music and fine and performing arts.

Overview of degrees in the Danish Higher Education System

Danish higher education institutions use the European Credit Transfer System (ECTS) for measuring study activities. 60 ECTS correspond to one year of full-time study.

Danish qualifications levels	**Ordinary higher education degrees**	**Adult/Continuing higher education degrees**	**Qualifications Framework for the European Higher Education Area – Bologna Framework**	**European/National Qualifications Framework for Lifelong Learning – EQF/NQF**
Academy Profession level	Academy Profession degree (90-150 ECTS)	Academy Profession degree (60 ECTS)	Short cycle	Level 5
Bachelor's level	Professional Bachelor's degree (180-240 ECTS)*	Diploma degree (60 ECTS)	First cycle	Level 6
	Bachelor's degree (within fine arts) (180 ECTS)			
	Bachelor's degree (180 ECTS)			
Master's level	Master's degree (within fine arts) (120-180 ECTS)	Master degree (60-90 ECTS)	Second cycle	Level 7
	Master's degree (120 ECTS)**			
PhD level	PhD degree (180 ECTS)		Third cycle	Level 8

* Can be obtained through a full regular bachelor's programme (180-240 ECTS) or a top up bachelor's programme (90 ECTS) following an Academy Profession degree. A few Professional Bachelor programmes are 270 ECTS.

** A few Master's programmes are up to 180 ECTS.

Qualification framework

The Danish qualification levels form the basis for the Danish National Qualifications Framework for Higher Education, which is certified in accordance with the overarching Bologna Framework according to the principles adopted by the European Ministers of Higher Education. Danish higher education qualifications at levels 5-8 in the Danish Qualifications Framework for Lifelong Learning (NQF) are also compatible with the levels 5-8 in the European Qualifications Framework (EQF).

Admission and progression

General access to higher education in Denmark requires a secondary school leaving examination or comparable qualifications. Admission to some particular programmes requires entrance examination or submission of a portfolio of artistic work.

Completion of a short cycle degree qualifies students for admission to a first cycle degree. Degree holders with a short cycle Academy Profession degree can obtain a Professional Bachelor's degree within the same field of study with a top up programme (90 ECTS). Completion of a first cycle degree qualifies students for admission to the second cycle.

Ordinary Higher Education degrees

The Academy Profession degree is awarded after 90-150 ECTS and includes a period of work placement of at least 15 ECTS. The programmes are development-based and combine theoretical studies with a practical approach. Programmes are, among others, offered within Marketing Management, Computer Science and Chemical and Biotechnical Science. The Danish title is field of study followed by the abbreviation *AK* and the English title is *AP Graduate in* [field of study].

The Professional Bachelor's degree is awarded after 180-240 ECTS and includes a period of work placement of at least 30 ECTS. The programmes are professional higher education programmes at bachelor level. They are development-based and combine theoretical studies with an applied approach. Examples of professional bachelor degree holders are nurses, primary and lower secondary school teachers and certain types of engineers. The Danish title is *Professionsbachelor i* [field of study] and the English title is *Bachelor of* [field of study].

The Bachelor's degree from a university is awarded after completion of a 3-year programme (180 ECTS). The programmes are research-based and are offered in all scientific fields. The Danish title is *Bachelor (BA) i* [field of study] or *Bachelor (BSc) i* [field of study] and the English title is *Bachelor of Arts (BA) in* [field of study] or *Bachelor of Science (BSc) in* [field of study].

The Bachelor's degree (within fine arts) is awarded after 180 ECTS. The programmes are based on research and artistic research. Programmes are offered within the arts. The Danish title is *Bachelor (BA) i* [field of study] or *Bachelor i musik (BMus)* [field of study] and the English title is *Bachelor of Arts (BA) in* [field of study] or *Bachelor of Music (BMus)* [field of study].
A higher education degree within theatre or filmmaking is awarded after 4 years of study (240 ECTS).

The Master's degree is awarded after 120 ECTS. The programmes are research-based and are offered in all scientific fields. The Danish title is abbreviated to *cand.*[latin abbreviation of academic area] *i* [field of study]. The English title is *Master of Arts (MA) in* [field of study] or *Master of Science (MSc) in* [field of study].

The Master's degree (within fine arts) is awarded after 120-180 ECTS. The programmes are based on research and artistic research. The Danish title is abbreviated to *cand.*[latin abbreviation of academic area] [field of study]. The English title is *Master of Arts (MA) in* [field of study] or *Master of Music (MMus)* [field of study].
Music Academies offer a specialist degree of 2 to 4 years following the master's degree.

The PhD degree is awarded after 180 ECTS. PhD programmes are offered by the universities and some institutions under the Ministry of Culture.

Detailed descriptions of degrees and degree levels can be found in the Qualifications Framework for Danish Higher Education at www.iu.dk.

Please consult the relevant Diploma Supplement for information about the learning outcome of the specific degrees.

Adult and continuing higher education
The programmes normally consist of 2 years of part-time study, equivalent to 1 year of full-time study (60 ECTS credits). Certain master 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.
Adult education qualifications are available at levels corresponding to those of the ordinary higher education system.

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

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

The 7-point grading scale	12	10	7	4	02	00	-3
The ECTS grading scale	A	B	C	D	E	Fx	F

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