



EXAMENSBEVIS | *DEGREE CERTIFICATE*

# Teknologie doktorsexamen

inom ämnet elektro- och systemteknik

*Degree of Doctor of Philosophy  
in the subject area of Electrical Engineering*

Pedro Miguel Otao Pereira

19900206-6919

Stockholm den 16 april 2019  
*Stockholm, Sweden 16 April 2019*

på rektors vägnar  
*on behalf of the President*

Helena Björk

Examenshandläggare  
*Degree Officer*

Sigbritt Karlsson  
rektor, Kungliga Tekniska högskolan, KTH  
*President, KTH Royal Institute of Technology*

har i enlighet med bestämmelserna i högskoleförordningen (1993:100) om utbildning på forskarnivå avlagt teknologie doktorsexamen. I utbildningen ingår utöver kurser att författa och vid en offentlig disputation försvara en vetenskaplig avhandling.

*has, in accordance with the Swedish Higher Education Ordinance (1993:100) concerning third-cycle studies, been awarded the Degree of Doctor of Philosophy, having passed the examinations included in the educational programme and publicly defended a scientific thesis.*

Kod Code	Kurs Course	Högskolepoäng Credits	Betyg Grade	Datum Date
FAK3014	Vetenskapsteori och forskningsmetodik - mindre kurs <i>The Theory and Methodology of Science - Minor Course</i>	3,0	Godkänd <sup>1</sup> Pass	2014-10-29
FEM3200	Optimal filtrering <i>Optimal Filtering</i>	10,0	Godkänd <sup>1</sup> Pass	2014-11-30
FEL3300	Konvex optimering med ingenjörstillämpningar <i>Convex Optimization with Engineering Applications</i>	6,0	Godkänd <sup>1</sup> Pass	2014-12-12
FLH3000	Grundläggande kommunikations- och undervisningslära <i>Basic Communication and Teaching</i>	3,0	Godkänd <sup>1</sup> Pass	2014-12-19
	Information Processing over Graphs <i>Information Processing over Graphs</i>	4,0	Godkänd <sup>1</sup> Pass	2015-03-19
	SF2842 Geometrisk styrteori <i>SF2842 Geometric Control Theory</i>	7,5	Godkänd <sup>1</sup> Pass	2015-03-20
FDS3103	Introduktion till vetenskapligt skrivande <i>Introduction to Scientific Writing</i>	2,0	Godkänd <sup>1</sup> Pass	2015-03-27
FEL3370	Mathematical Methods in Signals, Systems and Control <i>Mathematical Methods in Signals, Systems and Control</i>	8,0	Godkänd <sup>1</sup> Pass	2015-05-18
FEL3230	Doktorandkurs i hybrida system <i>Graduate Course on Hybrid Systems</i>	7,5	Godkänd <sup>1</sup> Pass	2015-05-25
FAK3015	Den uthållige forskaren <i>The Sustainable Scientist</i>	2,0	Godkänd <sup>1</sup> Pass	2015-06-18
FEM3220	Matrisalgebra <i>Matrix Algebra</i>	10,0	Godkänd <sup>1</sup> Pass	2016-07-06
FEL3330	Nätverk och multiagent regleringssystem <i>Networked and Multi-Agent Control Systems</i>	7,5	Godkänd <sup>1</sup> Pass	2016-10-17
	Doktorsavhandling <i>Doctoral thesis</i>		Godkänd <sup>1</sup> Pass	2019-02-22

#### Tillgodoräknade studier på forskarnivå

##### **Transferred postgraduate studies**

M22: Switched systems and control, 3,0<sup>2-3</sup>  
*M22: Switched systems and control*

4th Lucia School on Artificial Intelligence and Robotics: The Triumph of the Light. Univ. of Lisbon, Institute for Systems  
*4th Lucia School on Artificial Intelligence and Robotics: The Triumph of the Light. Univ. of Lisbon, Institute for Systems*

P 2015-05-29

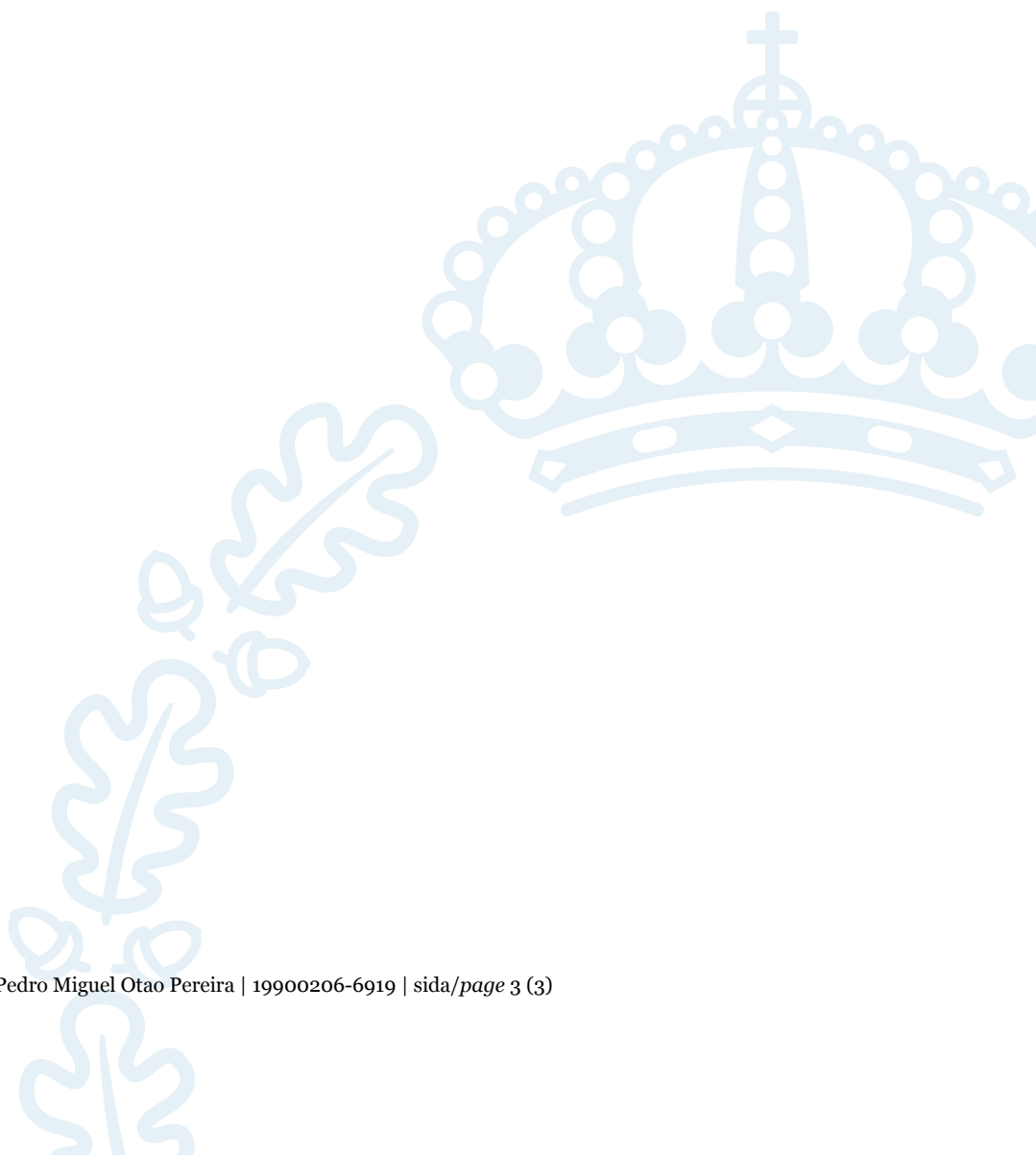
#### Avhandlingens titel

##### **Title of thesis**

Geometric Control of Thrust Propelled Systems  
*Geometric Control of Thrust Propelled Systems*

Noter/Notes

- 1 Betygsskala: Godkänd (G)  
*Grading scale: Pass (G)*
- 2 Betygsskala: G=Godkänd, U=Underkänd  
*Grading scale: P=Pass, F=Fail*
- 3 Kurs läst vid Centrale Supélec  
*Course taken at Centrale Supélec*
- 4 Kurs läst vid Universidade de Lisboa  
*Course taken at University of Lisbon*



## DIPLOMA SUPPLEMENT

This Diploma Supplement model was 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)** Otao Pereira
- 1.2 **Given name(s)** Pedro Miguel
- 1.3 **Date of birth (day/month/year)** 6 February 1990
- 1.4 **Student identification number or code (if available)** 19900206-6919

### 2. Information identifying the qualification

- 2.1 **Name of qualification and (if applicable) title conferred (in original language)**  
Teknologie doktorsexamen (Degree of Doctor of Philosophy)
- 2.2 **Main field(s) of study for the qualification**  
Electrical Engineering
- 2.3 **Name and status of awarding institution (in original language)**  
Kungliga Tekniska högskolan (Royal Institute of Technology).

State higher education institution with status of university.

- 2.4 **Name and status of institution (if different from 2.3) administering studies (in original language)**  
Not applicable.
- 2.5 **Language(s) of instruction/examination**  
Swedish and English.

### 3. Information on the level of the qualification

- 3.1 **Level of qualification**  
Forskarnivå/Third-cycle QF-EHEA SeQF 8/EQF 8. For information on the Swedish higher education system, see section 8.
- 3.2 **Official length of programme**  
240 högskolepoäng (credits)/240 ECTS. Duration of 4 years of full-time studies. A normal 40-week academic year corresponds to 60 credits (högskolepoäng). One credit corresponds to 1 ECTS credit.
- 3.3 **Access requirement(s)**  
There are general and (additional) specific entry requirements that should be fulfilled for access to higher education within all cycles. The general entry requirements for third-cycle studies are a second-cycle qualification, or completed courses worth at least 240 credits (of which 60 credits are at second-cycle level) or the equivalent level of knowledge acquired in Sweden or abroad. Furthermore, for entry to third-cycle studies, the applicant must be deemed able to benefit from the education.

### 4. Information on the contents and results gained

- 4.1 **Mode of study**  
Full-time equivalent.
- 4.2 **Programme requirements**  
The Swedish Higher Education Act takes account of 1) courses and study programmes based on scholarship or artistic practice and on proven experience, and 2) research and artistic research as well as development work. Reference to research below also applies to artistic research.

According to the Swedish Higher Education Act, third-cycle courses and study programmes shall be based fundamentally on the knowledge acquired by students in first- and second-cycle courses and study programmes, or its equivalent. In addition, third-cycle study programmes shall develop the knowledge and skills required to be able to undertake autonomous research. (For further information, see The Swedish Higher Education Act and The Higher Education Degree Ordinance: [www.uhr.se/en](http://www.uhr.se/en))

Studies encompass 240 credits. In addition to a scientific dissertation/thesis of at least 120 credits, doctorates include courses of at least 60 credits. The syllabus for the subject may require more credits from the course component. Of the total course component, at least 60 percent must be at third cycle. Courses at undergraduate level within the academic area

of engineering may not be included in this degree. For students with qualifying educational programmes other than the engineering background, deviations may be made from this requirement. Students with such educations may, to a certain extent, utilise courses outside the academic area of engineering as replacements for compulsory courses in the syllabus for the subject. This is to be documented in the student's individual course plan. Additional goals within the framework of the Higher Education Ordinance Degree procedures (HF Annex 2) and the goals stated in this local degree procedure are established by the Faculty Board in the syllabus for the subject at third cycle. For detailed information on programme goals please refer to each syllabus. This degree is entitled Teknologie doktorsexamen (PhD). In individual cases nomenclature other than teknologie may be used. Such decisions are to be taken by the Faculty Board.

**4.3 Programme details (e.g. modules or units studied), and the individual grades/marks/credits obtained (if this information is available on an official transcript this should be used here)**

A Degree of Doctor is awarded after the third-cycle student has completed a study programme of 240 credits in a subject in which third-cycle teaching is offered.

For the Degree of Doctor the third-cycle student shall have been awarded a pass grade for a research thesis (doctoral thesis) of at least 120 credits.

For more information, see Degree Certificate/Official Transcript.

**4.4 Grading scheme and, if available, grade distribution guidance**

There is no national grading system in Sweden. Higher education institutions may determine which grading system is to be used. For more information, see Degree Certificate/Official Transcript.

**4.5 Overall classification of the qualification (in original language)**

Not applicable for Swedish qualifications, since no overall grade is awarded for a degree and students are not ranked. For example, Grade Point Average (GPA) and other ranking systems are not used in Sweden.

**5. Information on the function of the qualification**

**5.1 Access to further study**

Not applicable. Doktorsexamen is the highest degree in the Swedish higher education system.

**5.2 Professional status (if applicable)**

Not applicable.

**6. Additional information**

**6.1 Additional information**

The education has been arranged within the PhD programme: Electrical Engineering

**6.2 Further information sources**

Kungliga Tekniska högskolan, SE-100 44 Stockholm, <http://www.kth.se>

The Swedish Council for Higher Education (Universitets- och högskolerådet) has been commissioned to act as the Swedish NARIC and is also part of ENIC. The ENIC-NARIC office provide information on education in Sweden. Please see: <http://www.uhr.se>

For information on Professional Qualifications Directive, Swedish National Assistance Centre for the Recognition of Professional Qualifications (Professional Qualifications Directive 2005/36/EC): [pqinfo@uhr.se](mailto:pqinfo@uhr.se)

For information on quality assurance, Swedish Higher Education Authority: <http://english.uka.se>

**7. Certification of the supplement**

**7.1 Date** 16 April 2019

**7.2 Signature**

*Helena Björk*

**7.3 Capacity** Degree Officer

**7.4 Official stamp or seal**

Please see 7.2

**8. Information on the national higher education system**

See attached information on the The Swedish higher education system.

# The Swedish higher education system

According to legislation after 1 January 2007.

The following description is approved by the Swedish Council for Higher Education.

The Swedish higher education system is based on the Swedish Higher Education Act (SFS 1992:1434) and the 1 January 2007 amendments to the Higher Education Ordinance (1993:100). The following description is a short summary based on the legislation regulating the Swedish higher education system.

Qualifications from all higher education institutions (universities, university colleges and independent higher education providers) that are recognized by the Government are of equal official value. The same legislation governs all state higher education institutions. All Swedish degrees are issued in accordance with the same degree ordinances.

## Quality assurance

The Swedish Higher Education Authority has been responsible for the quality assurance system for all higher education since 1 January 2013. For more information, please visit [www.uka.se](http://www.uka.se). Evaluation reports are available to the public.

## National Qualification Frameworks

The Swedish Higher Education Act and the Higher Education Ordinance have been amended in accordance with the agreements reached as part of the Bologna Process, including the Qualifications Frameworks in the European Higher Education Area (QF-EHEA). Legislation for a three-cycle structure of higher education started to apply in July 2007, and is now the only one in use in all Swedish higher education. Transitional provisions apply to courses and programmes that started prior to this. For more information, please visit [www.uhr.se/en](http://www.uhr.se/en) or [enic-naric.net](http://enic-naric.net).

In 2015, the Swedish Government decided on a national qualifications framework (SeQF), based on the European Qualifications Framework for Lifelong Learning (EQF). The SeQF has eight levels that are in accordance with the EQF

levels. Higher education qualifications are at levels six to eight. For more information, please visit [www.seqf.se](http://www.seqf.se).

## Credit system

Sweden has a system of credits (högskolepoäng); a normal 40-week academic year corresponds to 60 credits. The system is compatible with ECTS credits.

## Grading system

There is no national grading system in Sweden. Higher education institutions may determine which grading system is to be used. No overall grade is awarded for a degree and students are not ranked. For example, Grade Point Average (GPA) and other ranking systems are not used in Sweden.

## Access and admission

There are general and specific entry requirements for access to higher education within all cycles. The specific entry requirements vary according to the field of higher education and/or should be essential for students to be able to benefit from the course or study programme. The number of places is limited on all study programmes and courses.

The general entry requirements for first-cycle studies are the same for all higher education. General entry requirements can be attained by completing an upper-secondary school programme, via adult education at upper-secondary school level or the applicants achieving a comparable level of learning outcomes through other education, practical experience or other circumstances.

The general entry requirements for second-cycle studies are a first-cycle qualification of at least 180 credits, or a corresponding foreign qualification. An applicant may also be accepted on the basis of a comparable level of learning outcomes obtained through other education, practical experience or other circumstances. →

The general entry requirements for third-cycle studies are a second-cycle qualification, or completed courses worth at least 240 credits (of which 60 credits are at second-cycle level) or the equivalent level of knowledge acquired in Sweden or abroad. Furthermore, for entry to third-cycle studies, the applicant must be deemed able to benefit from the education.

## Qualifications

All courses, study programmes and qualifications are on one of three levels: first-, second- or third-cycle. In the Higher Education Ordinance, the Government has determined which qualifications may be awarded, as well as their scope, requirements and intended learning outcomes. There are three categories of qualifications: general; the fine, applied and performing arts; and professional qualifications. For some more information, please see below.

## General qualifications

### First-cycle (SeQF/EQF 6)

*Högskoleexamen* (Higher Education Diploma) requires 120 credits and an independent project (degree project).

*Kandidatexamen* (Degree of Bachelor) requires 180 credits. At least 90 credits must be completed in the main field of study, including an independent project (degree project) worth 15 credits.

### Second-cycle (SeQF/EQF 7)

*Magisterexamen* (Degree of Master (60 credits)) requires 60 credits. At least 30 credits must be completed in the main field of study, including an independent project (degree project) worth 15 credits. In addition, the student must normally hold a kandidatexamen, or a professional degree of at least 180 credits, or an equivalent foreign degree.

*Masterexamen* (Degree of Master (120 credits)) requires 120 credits. At least 60 credits must be completed in the main field of study, including an independent project (degree project) worth at least 30 credits. In addition, the student must normally hold a kandidatexamen, or a professional degree of at least 180 credits or an equivalent foreign degree.

### Third-cycle (SeQF/EQF 8)

*Licentiatexamen* (Degree of Licentiate) requires at least 120 credits, including a research thesis worth at least 60 credits. A higher education institution may decide that a licentiatexamen can be awarded as a separate qualification or as a step on the way to doktorsexamen (see below).

*Doktorsexamen* (Degree of Doctor) requires 240 credits, including a research thesis (doctoral thesis) worth at least 120 credits. The thesis must be presented at a public defence.

## Qualifications in the fine, applied and performing arts

Qualifications in the fine, applied and performing arts are awarded at all three cycles and corresponding SeQF levels. At first-cycle level: konstnärlig högskoleexamen (Higher Education Diploma) and konstnärlig kandidatexamen (Degree of Bachelor of Fine Arts). At second-cycle level: konstnärlig magisterexamen (Degree of Master of Fine Arts (60 credits)) and konstnärlig masterexamen (Degree of Master of Fine Arts (120 credits)). Two third-cycle qualifications are awarded: konstnärlig licentiatexamen (Degree of Licentiate) and konstnärlig doktorsexamen (Degree of Doctor).

## Professional qualifications

Professional qualifications are offered at either first- or second-cycle level and corresponding SeQF levels. These qualifications may stretch over two cycles and are awarded in areas that include engineering, health care, agriculture, law, and education. Professional qualifications are regulated by national legislation and are considered regulated education subject to the Professional Qualifications Directive 2005/36/EC.

## Titles of qualifications

Translations into English of all titles of qualifications are regulated at the national level. Higher education institutions may decide to add a prefix to a qualification title e.g. filosofie kandidatexamen or medicine doktorsexamen or/and add a major field of studies e.g. civilingenjörsexamen i maskinteknik.