KØBENHAVNS UNIVERSITET
UNIVERSITY OF COPENHAGEN

FILIPPOS DIMITRIOS KTISTAKIS

cpr. 170393-4931

har den 28. maj 2025	*has on 28 May 2025*
opnået	*been awarded the degree of*
kandidatgraden i	*Master of Science in*
fysik	*Physics*
og titlen	*and the title*

cand.scient.
candidatus scientiarum

Bo Jellesmark Thorsen
Dekan/*Dean*

Karen Rønnow
Uddannelseschef/*Director of Studies*

DET NATUR- OG BIOVIDENSKABELIGE FAKULTET
FACULTY OF SCIENCE

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KØBENHAVNS UNIVERSITET
DET NATUR- OG BIOVIDENSKABELIGE FAKULTET

Filippos Dimitrios Ktistakis
Cpr.: 170393-4931

har gennemført kandidatuddannelsen i
fysik
28. maj 2025

Oversigt over prøver og bedømmelser side 1 af 2

Følgende resultater er opnået	**Resultat 7-trinsskala**	**Resultat ECTS-skala**	**ECTS point**
Speciale			
Development of a Misalignment Detection Tool for the McStas Neutron Scattering Simulation Package Using Optimization and Machine Learning Approaches *Eksamenssprog engelsk*	4	D	60,0
Specialisering i computational physics			
Scientific Computing *Eksamenssprog engelsk*	10	B	7,5
Inverse Problems *Eksamenssprog engelsk*	12	A	7,5
Applied Statistics: From Data to Results *Eksamenssprog engelsk*	7	C	7,5
Advanced Methods in Applied Statistics *Eksamenssprog engelsk*	4	D	7,5
High Performance Parallel Computing *Eksamenssprog engelsk*	10	B	7,5
Applied Machine Learning *Eksamenssprog engelsk*	10	B	7,5
Physics of Molecular Diseases *Eksamenssprog engelsk*	7	C	7,5

4. juli 2025

Betina Kongsbak
SCIENCE Uddannelse

KØBENHAVNS UNIVERSITET
DET NATUR- OG BIOVIDENSKABELIGE FAKULTET

Filippos Dimitrios Ktistakis
Cpr.: 170393-4931

har gennemført kandidatuddannelsen i
fysik
28. maj 2025

Oversigt over prøver og bedømmelser side 2 af 2

Følgende resultater er opnået	**Resultat 7-trinsskala**	**Resultat ECTS-skala**	**ECTS point**
Projekt uden for kursusregi.....	10	B	7,5
Numerical Optimization of the McStas Neutron Scattering Simulation Package			
Eksamenssprog engelsk			

Adgangsgrundlaget til kandidatuddannelsen
Udenlandsk bachelor, National and Kapodistrian University Athens - Ethniko kai Kapodistriako Panepistimio Athinon, Grækenland

4. juli 2025

Betina Kongsbak
SCIENCE Uddannelse

KØBENHAVNS UNIVERSITET
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Kompetenceprofil for uddannelsen

Efter endt uddannelse har en kandidat i fysik med specialisering i computational physics tilegnet sig følgende:

Viden om:
- Den nyeste udvikling inden for en særlig specialisering i fysik.
- Aktuelle problemstillinger inden for astrofysik, biofysik, geofysik, kvantefysik, komplekse fysiske systemer eller computational physics, som er relevante for erhvervslivet og samfundet, samt mulige løsninger.
- Den nyeste udvikling inden for matematiske, digitale og numeriske metoder til kvantificering og løsning af problemer inden for fysik med henblik på at opnå, analysere og visualisere kvantificerede data og numerisk modellering af fysiske systemer.
- Generelle teknikker og tanker bag numerisk software skrevet af fagfolk.
- Generelle begreber, der er nødvendige for at sikre kvalificeret anvendelse af egnet software til løsning af problemstillinger inden for den computerbaserede fysik.
- Simple matematiske modeller fra videnskabens verden og numerisk analyse heraf.
- Tankerne bag og motivationen for grundlæggende numeriske metoder til løsning af: lineære og ikke-lineære ligninger, lineær og ikke-lineær optimering, egenværdi-problemer, problemer med startværdien for ordinære differentialligninger, delvise differentialligninger, Fast Fourier Transform-algoritmen samt anvendelse af Monte Carlo-metoder.

Færdigheder i at:
- Anvende de nyeste og mest avancerede eksperimentelle eller teoretiske teknikker, målemetoder og udstyr i felten og/eller i laboratoriet.
- Vælge og kritisk vurdere teoretiske, eksperimentelle og numeriske metoder til kvantificerede analyser af data og videnskabelige problemstillinger inden for fysikken.
- Sammenfatte et forskningsemne baseret på original videnskabelig litteratur og eget arbejde, både mundtligt og skriftligt med brug af det engelske sprog.
- Anvende hensigtsmæssige IT-løsninger og digitale værktøjer til informations- og databehandling, kommunikation og præsentationer inden for fysikken.
- Vælge en relevant numerisk metode til løsning af en problemstilling eller delproblemstilling.
- Vurdere den numeriske metode i forhold til potentiel nøjagtighed, beregningsmæssig effektivitet, robusthed og krav til hukommelse.
- Vurdere kvaliteten af løsningen i forhold til den opnåede nøjagtighed og følsomhed over for variationer i modelparametre.
- Beskrive og kvantificere datausikkerheder og modelleringsfejl.
- Beskrive tilgængelig information under anvendelse af probabilistiske/statistiske modeller og metoder.

4. juli 2025

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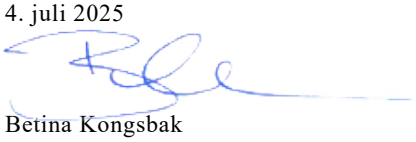
Kompetencer til at:
- Lede, rådgive om og forske i problemstillinger inden for fysikken baseret på dybdegående viden om relevante fysiske egenskaber og fysikkens love.
- Formulere videnskabelige problemstillinger selvstændigt inden for fagområdet, udvikle og gennemføre undersøgelser ved hjælp af teoretiske, eksperimentelle og numeriske metoder med henblik på at forklare, kommunikere og perspektivere den videnskabelige problemstilling både mundtligt og skriftligt.
- Kombinere og videreudvikle avancerede metoder og teknikker til løsning af komplekse problemstillinger inden for fysikken, herunder de nødvendige kompetencer til at vurdere validiteten af de teoretiske rammer, begrænsningerne i det eksperimentelle eller numeriske forsøg, resultaternes kompleksitet, fejlkilder og metodiske usikkerheder.
- Anvende begreber og metoder fra fysikken til at foreslå innovative bæredygtige løsninger på relevante problemstillinger i erhvervslivet og samfundet.
- Formidle viden om fagområdet i både akademiske og ikke-akademiske sammenhænge.
- Arbejde forskningsbaseret med andre, både med jævnaldrende og inden for en forskningsgruppe.
- Udføre numerisk analyse af simple matematiske modeller af fysiske systemer med henblik på at løse konkrete problemstillinger og vurdere de opnåede resultater.
- Behandle datausikkerheder og vurdere løsningens nøjagtighed og resolution.
- Anvende metoder og værktøjer fra et bredt spektrum af fysiske discipliner med henblik på at beskrive og forstå numeriske problemstillinger af relevans for samfundet, erhvervslivet, virksomheder og undervisning.

4. juli 2025



Betina Kongsbak
SCEINCE Uddannelse

UNIVERSITY OF COPENHAGEN
FACULTY OF SCIENCE

Filippos Dimitrios Ktistakis
Cpr.: 170393-4931

has completed the Master's programme in
Physics
28 May 2025

Summary of examinations and grades page 1 of 2

The following grades were awarded	Grade 7-point scale	Grade ECTS scale	ECTS credits
Master's Thesis			
Development of a Misalignment Detection Tool for the McStas Neutron Scattering Simulation Package Using Optimization and Machine Learning Approaches ..... *Exam language English*	4	D	60,0
Specialisation in Computational Physics			
Scientific Computing ..... *Exam language English*	10	B	7,5
Inverse Problems ..... *Exam language English*	12	A	7,5
Applied Statistics: From Data to Results ..... *Exam language English*	7	C	7,5
Advanced Methods in Applied Statistics ..... *Exam language English*	4	D	7,5
High Performance Parallel Computing ..... *Exam language English*	10	B	7,5
Applied Machine Learning ..... *Exam language English*	10	B	7,5
Physics of Molecular Diseases ..... *Exam language English*	7	C	7,5

4 July 2025

Betina Kongsbak
SCIENCE Study Administration

UNIVERSITY OF COPENHAGEN
FACULTY OF SCIENCE

Filippos Dimitrios Ktistakis
Cpr.: 170393-4931

has completed the Master's programme in
Physics
28 May 2025

Summary of examinations and grades page 2 of 2

The following grades were awarded	Grade 7-point scale	Grade ECTS scale	ECTS credits
Project outside Course Scope.....	10	B	7,5
Numerical Optimization of the McStas Neutron Scattering Simulation Package			
Exam language English			

Requirements for the graduate programme

International bachelor's degree, National and Kapodistrian University Athens, Greece

4 July 2025

Betina Kongsbak
SCIENCE Study Administration

UNIVERSITY OF COPENHAGEN
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28 May 2025

Skills profile for the programme

Graduates holding an MSc in Physics with a specialisation in Computational Physics have acquired the following:

Knowledge about:
- State-of the-art within a particular specialization in physics.
- Current problems within astrophysics, biophysics, geophysics, quantum physics, complex physics or computational physics relevant to industry and society and their possible solutions.
- State-of-the-art mathematical, digital and numerical methods for quantifying and solving problems within physics, to obtain, analyse and visualize quantified data, and for numerical modelling of physical systems.
- General techniques and ideas found in professionally written numerical software.
- General concepts needed for applying suitable software in a qualified manner to problems in computational physics.
- Simple mathematical models from science and numerical analysis of them.
- The ideas behind and the motivation for fundamental numerical methods for the solution of linear and nonlinear equations, linear and nonlinear optimization, eigenvalue problems initial value problems for ordinary differential equations, partial differential equations, the Fast Fourier Transform, and the use of Monte Carlo methods.

Skills in/to:
- Apply the most recent and advanced experimental or theoretical techniques, measuring methods and equipment in the field and/or in the laboratory.
- Select and critically evaluate theoretical, experimental, and numerical methods for quantified analyses of data and scientific problems within the field of physics.
- Summarise a research subject based on original scientific literature and own work, both in written and oral form, and using the English language.
- Apply appropriate IT-solutions and digital tools for information and data processing, communication and presentations within the field of physics.
- Choosing an appropriate numerical method for the solution of the problem or subproblem.
- Evaluate the numerical method with respect to potential accuracy, computational efficiency, robustness, and memory requirements.
- Evaluate the quality of the solution with respect to the accuracy obtained and the sensitivity to model parameter variations.
- Describe and quantify data uncertainties and modeling errors.
- Describe available information using probabilistic/statistical models and methods.

4 July 2025

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SCIENCE Study Administration

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FACULTY OF SCIENCE

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28 May 2025

Competences in/to:
- Manage, advise on, and conduct research on problems within the field of physics, based on thorough knowledge of the relevant physical properties and the laws of physics.
- Independently formulate scientific problems within the subject area, develop and conduct investigations using theoretical, experimental or numerical methods, to explain, communicate and put into perspective the scientific problem, both orally and in writing.
- Combine and further develop advanced methods and techniques to solve complex problems within the field of physics, including competences required to evaluate the validity of the theoretical framework, the limitations of the experimental or numerical set-up, the complexity of the results, sources of error and methodological uncertainties.
- Apply concepts and methods from physics to suggest innovative sustainable solutions for relevant problems in industry and society.
- Disseminate knowledge about the subject area in both academic and non-academic contexts.
- Research-based work with others, both with peers and within a research group.
- Performing numerical analysis of simple mathematical models of physical system to solve concrete problems and to evaluate the results obtained.
- Treating data uncertainties and evaluating the accuracy and resolution of the solution.
- Apply methods and tools from a wide range of physical disciplines, in order to describing and understanding numerical problems relevant to society, industry, companies, and teaching.

4 July 2025

Betina Kongsbak
SCIENCE Study Administration

UNIVERSITY OF COPENHAGEN
FACULTY OF SCIENCE

Diploma Supplement

The purpose of the Diploma 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 is free from any value judgements, equivalence statements or suggestions about recognition. This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO.

1. INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1. Family name(s): Ktistakis

1.2. Given name(s): Filippos Dimitrios

1.3. Date of birth: 17 March 1993

1.4. Danish civil registration number: 170393-4931

2. INFORMATION IDENTIFYING THE QUALIFICATION

2.1. Name of qualification and title conferred *(in Danish):* Cand. scient. i fysik, candidatus scientiarum

Name of qualification and title conferred *(in English)***:** Master of Science (MSc) in Physics, candidatus scientiarum

2.2. Main fields of study: Physics

2.3. Name and status of awarding institution: Name: Københavns Universitet/University of Copenhagen
Status: The University of Copenhagen is a state-recognised higher education institution, regulated according to the Ministry of Higher Education and Science. The University of Copenhagen is a university that has undergone external quality assurance by the Danish Accreditation Institution (in Danish: Danmarks Akkrediteringsinstitution), that is certified to follow the European Standards and Guidelines through registration in EQAR and membership in ENQA, in Denmark.

2.4. Name and status of institution administering the studies (See 2.3.)**:** Same as above

2.5. Language(s) of instruction/examination: Primarily English and to some extent Danish

3. INFORMATION ON THE LEVEL OF THE QUALIFICATION

3.1. Level of qualification: Master's degree at NQF/EQF Level 7 referring to Second Cycle in the Bologna QF.

3.2. Official length of programme: 2 years = 120 ECTS credit points

3.3. Access requirements: A completed Bachelor's degree in Physics or another relevant Bachelor's degree.

4. INFORMATION ON THE CONTENTS AND RESULTS GAINED

4.1. Mode of study: Full time study

4.2. Programme learning outcomes: Please refer to the enclosed skills profile.

4.3. Programme details and individual grades/marks/credits obtained: Please refer to the enclosed grade transcript.

4.4. Grading scheme and if applicable grade distribution information: Please refer to the enclosed explanation of the Danish education system and the 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 (MSc) in Physics gives access to further study within the field of Natural Science at NQF/EQF level 8 referring to Third Cycle in the Bologna QF

5.2. Professional status: The MSc Programme in Physics qualifies students to become professionals within business functions and/or areas such as: PhD-student in different profession directions at science and medical science faculties or in industry; High school teacher; Specialist in the consultancy industry, eg. datascience, wind and natural resources; Biophysicist in the pharmaceutical industry; Hospital physicist; Meteorologist; Risk Manager or Analyst in the bank sector or insurance companies; A wide range of job opportunities within Danish and international high-tech companies, international agencies and national authorities; Various jobs within research and development using physics as the basis of modern technology and a sustainable development, for example in high-tech companies and the consultancy industry

6. ADDITIONAL INFORMATION

6.1. Additional information: Founded in 1479 by the Danish King Christian I, the University of Copenhagen is Denmark's oldest and largest institution of research and higher education. More than 37,000 students are enrolled in undergraduate and graduate programmes, plus an additional 2,500 PhD students. Staff members number 9,000. The University is divided into six faculties: Theology, Law, Social Sciences, Health and Medical Sciences, Humanities and Science; all situated in the capital of Denmark.

6.2. Further information:

Faculty of Science
Bülowsvej 17
DK - 1870 Frederiksberg C
Website: science.ku.dk/english
Phone +4535332828
E-mail: science@science.ku.dk

General information on higher education in Denmark can be obtained from the following two homepages:
Ufm.dk Uddannelses- og Forskningsministeriet – The Ministry of Higher Education and Science
Enic-naric.net The National Academic Recognition Information Centres and the European National Information Centre on Academic Recognition and Mobility (ENIC/NARIC)

7. CERTIFICATION OF THE SUPPLEMENT

7.1. Date: 4 July 2025

7.2. Betina Kongsbak

7.3. Head of Section

UNIVERSITY OF COPENHAGEN

8. INFORMATION ON THE DANISH HIGHER EDUCATION SYSTEM

June 2016

Public higher education institutions in Denmark are regulated by national legislation concerning degree structures, teacher qualifications and examinations. Accreditation in higher education is undergoing transition from programme-based accreditation to institutional accreditation. Programmes and institutions are accredited by national, independent accreditation agencies and the Accreditation Council.

Higher education institutions

Higher education is offered by five types of higher education institutions:

1. Business academies (Erhvervsakademi) offering professionally oriented short cycle and first cycle degree programmes.
2. University Colleges (Professionshøjskole) offering professionally oriented first cycle degree programmes.
3. Maritime Education and Training Institutions offering professionally oriented short cycle and first cycle degree programmes.
4. General and specialised research universities (Universitet) offering first, second and third cycle degree programmes in academic disciplines.
5. University level institutions offering first, second and third cycle degree programmes in subject fields such as architecture, design, music, and fine and performing arts.

Most higher education institutions are regulated by the Ministry of Higher Education and Science (type 1-5).

The Ministry of Culture regulates a number of higher education institutions offering programmes within fine and performing arts (type 5).

Qualification framework

The 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 of the Danish Qualifications Frame-work for Lifelong Learning (NQF) correspond with levels 5-8 of the European Qualifications Framework (EQF).

Admission and progression

General access to higher education in Denmark requires an Upper Secondary School Leaving Certificate or comparable qualifications. Admission to some particular programmes requires entrance examination or submission of a portfolio of artistic work. Holders of an Academy Profession degree can obtain a Professional Bachelor's degree within the same field of study through a top-up programme. 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].

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.*

The Professional Bachelor's degree is awarded after 180-270 ECTS and includes a period of work placement of at least 30 ECTS. The programmes are applied programmes. They are development-based and combine theoretical studies with a practical approach. Examples of professional bachelor's 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 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 (BSc) of Science 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 fine arts. The Danish title is Bachelor (BA) i [field of study], Bachelor i musik (BMus) [field of study] or Bachelor i billedkunst (BFA) [field of study] and the English title is Bachelor of Arts (BA) in [field of study], Bachelor of Music (BMus) [field of study] or Bachelor of Fine Arts (BFA) in [field of study]. A higher education degree within theatre or filmmaking is awarded after 3-4 years of study (180-240 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], Master of Music (MMus) [field of study] or Master of Fine Arts (MFA) in [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 university level institutions offering degrees in the artistic and cultural field.

Detailed descriptions of degree levels can be found in the Danish Qualifications Framework at www.nqf.dk. Please consult the relevant Diploma Supplement for information about the learning outcome of any specific degree.

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 and continuing education is available at levels corresponding to qualifications of the ordinary higher education system.
- The Further Adult Education degree (videregående voksenuddannelse/akademiuddannelse) 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. Apart from the 7-point grading scale, pass/fail assessment may also be used. 02 is the minimum grade for passing an exam.

Description of grades: 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; 10: For a very good performance displaying a high level of command of most aspects of the relevant material, with only minor weaknesses; 7: For a good performance displaying good command of the relevant material but also some weaknesses; 4: For a fair performance displaying some command of the relevant material but also some major weaknesses; 02 For a performance meeting only the minimum requirements for acceptance; 00: For a performance which does not meet the minimum requirements for acceptance; -3 For: a performance which is unacceptable in all respects.