Important notice: Only the German text, as published in the official law gazette, is legally binding. This English version is only intended to aid your understanding and does not have legal force. In the event of discrepancies between the English and German wording, the German wording shall prevail.

Subject-specific study and examination regulations for the degree programme Computational Mathematics culminating in the degree Master of Science at the University of Passau

of 27 November 2017

On the basis of art. 13 sec. 1 clause 2 in conjunction with art. 43 sec. 5 clause 2, art. 58 sec. 1 clause 1 and art. 61 sec. 2 clause 1 of the Bavarian Higher Education Act (Bayerisches Hochschulgesetz; BayHSchG), the University of Passau lays down the following by-laws:

Table of contents

§ 1 Scope

[1]The present subject-specific study and examination regulations (FStuPO) supplement the general study and examination regulations (AStuPO) for degree programmes culminating in the qualification Master of Science from the Faculty of Computer Science and Mathematics at the University of Passau, as amended. [2]In the event that a provision contained herein is incompatible with a provision in the general study and examination regulations (AStuPO), the provision of the general study and examination regulations (AStuPO) shall prevail.

§ 2 Aim of the qualification and examination objectives

(1) The degree programme in Computational Mathematics, which culminates in the degree Master of Science is offered by the Faculty of Computer Science and Mathematics at the University of Passau.

(2) [1]In addition to being a science in its own right, mathematics also plays a fundamental role in the quantitative areas of practically all other academic disciplines, particularly in the natural sciences, engineering, business administration, economics, medicine and psychology. [2]Mathematical results permeate nearly all facets of life and are a necessary prerequisite for the vast majority of modern technologies. [3]This goes hand in hand with the development of increasingly powerful IT systems, allowing us to mathematically process enormous amounts of data and solve ever more complex problems. [4]Therefore, mathematicians are especially sought after wherever high-level analytical skills are a requirement. [5]Outside academic and research organisations, mathematicians find employment in nearly all private- and public-sector organisations. Nowadays, mathematicians typically make heavy use of computer technology in their daily work. [6]Traditionally, mathematicians are employed in the pharmaceutical industry, in the financial industry, insurance companies, consulting and business

intelligence, market research, logistics, information technology and in the research and development departments of high-tech companies. [7]Building on a related bachelor's degree, it is the aim of the M.Sc. Computational Mathematics to impart advanced competencies that qualify the student to occupy a position of responsibility in one of the above occupational fields. [8]Students are enabled to independently engage in scientific enquiry, to critically assess scientific findings and use these in a targeted manner to solve complex theoretical or practical problems. [9]The master's programme places a special focus on developing its students' ability to formalise given problems in a way that allows for algorithmic processing as well as enabling them to choose or develop suitable algorithms and subsequently apply them in an appropriate manner. [10]The degree programme is theoretical in its orientation, with strongly application-oriented components. [11]Studying this programme, students can gain advanced knowledge in the mathematical areas of Cryptography, Computer Algebra, Algorithmic Algebra and Geometry, Image and Signals Processing, Statistics and Stochastic Simulation, Dynamical Systems and Control Theory as well as expert knowledge in Computer Science fields such as Data Management, Machine Learning and Data Mining. [12]Furthermore, students have the opportunity to learn how to apply their knowledge to tackle problems in areas as diverse as Marketing, Predictive Analytics, Computational Finance, Digital Humanities, IT Security and Robotics.

(3) The language of instruction is English.

§ 3 Entry qualifications (subject components)

[1]In accordance with § 4 sec. 1 clause 1 no. 1 of the general study and examination regulations (AStuPO) applicants must have a university degree in Mathematics or in a related subject, or an equivalent qualification with a corresponding Mathematics subject component comprising a minimum of 110 ECTS credits.

§ 4 Contents of the degree programme and module groups

(1) [1]The degree programme is broken down into compulsory core modules and compulsory elective module groups. [2]The compulsory elective modules consist of eight module groups. [4]Students who have completed more modules than are required to earn a total of 120 ECTS credits at the time of making the request should indicate which of the modules should be counted towards their final grade (overall average mark).

(2) [1]The compulsory core modules are as follows:

Module	ECTS value	Examination
Mathematics Seminar 1	5	Written preparation (maximum of 10 pages) and oral presentation (approx. 45 to 90 minutes); the exact examination format is published on the noticeboards and on the faculty's website before or at the start of the semester.
Mathematics Seminar 2	5	Written preparation (maximum of 10 pages) and oral presentation (approx. 45 to 90 minutes); the exact examination format is published on the noticeboards and on the faculty's website before or at the start of the semester.
Presentation of the master's thesis	3	Presentation (approx. 45 to 90 minutes); the exact type of examination is announced beforehand by the examiner.

[2]In order to register for the 'Presentation of the master's thesis' module, students must have previously submitted their master's thesis pursuant to § 21 sec. 6 of the general study and examination regulations (AStuPO).

(3) The following module groups are available in the compulsory elective module area:

1) **Algebra, Geometry and Cryptography**
This module group imparts advanced results in the areas of algebra and geometry, which constitute the fundament for algorithmic calculations, particularly in cryptography but also in many other mathematical areas.

2) **Mathematical Logic and Discrete Mathematics**
The theoretical possibilities and limitations of algorithm-based solutions are treated in this module group.

3) **Analysis, Numerics and Approximation Theory**
Methods from the fields of mathematical analysis, applied harmonic analysis and approximation theory for modelling and approximating continuous and discrete data and systems as well as efficient numerical implementation and evaluation of these methods are the scope of this module group.

4) **Dynamical Systems and Optimisation**
Dynamical systems theory deals with the description of change over time. This module group is concerned with methods used for the modelling, analysis, optimisation and design of dynamical systems, as well as the numerical implementation of such techniques.

5) **Stochastics, Statistics**
This module group deals with methods for modelling and analysing complex random phenomena as well as the construction, analysis and optimisation of stochastic algorithms and techniques used in statistical data analysis.

6) **Data Analysis and Data Management and Programming**
This module group examines the core methods used in computer science for the analysis of data of heterogeneous modalities (e.g. multimedia data, social networks and sensor data) and for the realisation of data analysis systems.

7) **Applications**
In this module group, students practise applying the mathematical methods learned in module groups 1 to 6 to real-world applications such as Marketing, Predictive Analytics and Computational Finance.

8) **Key Competencies and Language Training**
In this module group, students choose seminars that develop their non-subject-specific skills, such as public speaking, academic writing and other soft skills; they may also undertake internships. This serves to complement their technical expertise gained during the degree studies and helps to prepare them for their professional life after university.

§ 5 Types of examination

(1) [1]As a rule, modules make use of one of the following types of examination:

	Course	ECTS credits	Examination
1)	Lecture with or without accompany-ing tutorial	5–9	– Written examination (45 to 120 minutes) or – Oral examination (approx. 15 to 30 minutes) or – Presentation (approx. 20 minutes) and final report (approx. 20 pages) or – Portfolio

2)	Lecture with accompany-ing seminar	5–9	Final report (maximum 20 pages) and presentation (approx. 20 minutes) on the project.
3)	External internship	4	Internship report and oral examination (approx. 20 minutes)
4)	Seminar	5	Written preparation (10 pages maximum) and presentation (approx. 45 to 90 minutes).

[2]Where several examination formats are available to choose from for a course type, the exact examination format is specified in the module catalogue. [3]If the module catalogue also lists several alternative examination formats for a module, the exact examination format is announced on the noticeboards and on the faculty's website before or at the start of the semester. [4]The module catalogue may specify additional course types or examination formats for compulsory elective modules.

(2) [1]The portfolio may consist of: written documentations, technical reports, documented source code for individual modules, live system demonstrations, video demonstrations, partial presentations on individual components, final presentations. [2]Students should work on their portfolio during the semester in which the module is studied. [3]The work duration for the individual components of the portfolio assessment must not exceed four weeks. [4]The last component of the portfolio to be assessed must be submitted by no later than four weeks after the end of lectures for the semester. [5]Non-technical reports should not exceed 10 pages in length. [6]If a technical report consists of partial reports, the length of each partial report should be approx. five pages. [7]Partial presentations should be approx. 10 minutes in length and should involve the use of suitable media and presentation styles. [8]The final presentation should be approx. 15 minutes in length and should involve the use of suitable media and presentation styles.

§ 6 Master's examination (required compulsory modules and compulsory elective modules)

[1]In order to pass the master's examination the following compulsory modules and compulsory elective modules must be completed pursuant to § 9 sec. 2 of the general study and examination regulations (AStuPO) and a total of at least 120 ECTS credits must be accrued:

1) the compulsory core modules pursuant to § 4 sec. 2
2) modules amounting to a combined minimum of 50 ECTS credits from one of the module groups listed in § 4 sec. 3 nos. 1 to 5, specifically:
   - a minimum of 15 ECTS credits from the module groups listed in § 4 sec. 3 nos. 1 and 2
   - a minimum of 15 ECTS credits from the module groups listed in § 4 sec. 3 nos. 3 to 5
3) modules amounting to a combined minimum of 10 ECTS credits from the module groups listed in § 4 sec. 3 nos. 6 and 7
4) a minimum of 4 ECTS credits from the module group listed under § 4 sec. 3 no. 8

[2]In order to be allowed to commence writing the master's thesis pursuant to § 20 sec. 1 AStuPO, students must have completed modules amounting to a minimum of 60 ECTS credits.

§ 7 Effective date

These by-laws come into effect on the day after their announcement.

Issued as per the resolution of the Senate of the University of Passau of 28 June 2017 and as approved by the President of the University of Passau on 24 November 2017, reference number VII/2.I-10.3950/2017.
Passau, 27 November 2017
UNIVERSITY OF PASSAU
The President

Professor Carola Jungwirth

These by-laws were issued by the University on 27 November 2017 and announced on 27 November 2017 by posting on the noticeboards of the University.
The date of announcement is 27 November 2017.