UNIVERSITÄT BONN

RHEINISCHE
FRIEDRICH-WILHELMS-
UNIVERSITÄT BONN

Translation

Examination Regulations
for the Consecutive Master's Degree Program

"Geodetic Engineering"

at the Faculty of Agriculture of the University of Bonn

This document is an official translation of the Examinations Regulations published in Amtl. Bek. der Universität Bonn, 50. Jg., Nr. 72, 21. Oktober 2020.

Please note that only the original German version is legally binding.

April 24, 2024

Examination Regulations for the
Consecutive Master's Degree Program

Geodetic Engineering

of the Faculty of Agriculture

of the University of Bonn

dated October 16, 2020

This translation is provided solely for informational purposes. Only the German original is legally binding.

By virtue of § 2, para. 4 and § 64, para. 1 of the Higher Education Act of North Rhine-Westphalia (*Gesetz über die Hochschulen des Landes Nordrhein-Westfalen*, HG) of September 16, 2014 (Legal and Regulatory Gazette of North Rhine-Westphalia, p. 547) as last amended by Article 2 of the Act Amending the Act Establishing "The University Admissions Foundation" and Other Higher Education Laws (*Gesetz zur Änderung des Gesetzes zur Errichtung einer Stiftung „Stiftung für Hochschulzulassung" und zur Änderung weiterer Gesetze im Hochschulbereich*) of September 1, 2020 (Legal and Regulatory Gazette of North Rhine-Westphalia, p. 890), the Faculty of Agriculture of the University of Bonn issued the following regulations:

Contents

Part 1
Scope

§ 1
Scope

(1) Students who commence their studies in the consecutive master's degree program Geodetic Engineering at the University of Bonn after entry into force of these Examination Regulations are subject to these Examination Regulations.

(2) The Examination Regulations for the consecutive master's degree program Geodetic Engineering of the Faculty of Agriculture of the University of Bonn dated September 11, 2017 (Official Announcements of the University of Bonn, 47th year, no. 25, dated September 14, 2017), hereinafter referred to as MPO-GE-2017, will be repealed as of September 30, 2023. Examinations in accordance with MPO-GE-2017 will be admissible until September 30, 2022. The examination board may extend this period by six months in justifiable cases.

(3) Students who, having commenced their studies prior to the coming into force of these Examination Regulations, are subject to MPO-GE-2017 and have not yet completed all necessary examinations, may
a. continue their studies under MPO-GE-2017 until the deadline stated in para. 2; or
b. irrevocably adopt these Examination Regulations by written request.
Students who continue their studies under MPO-GE-2017 and do not graduate by September 30, 2022 shall adopt these Examination Regulations ex officio on October 1, 2022. Credit for prior academic achievements shall be granted. Para. 2 sentence 3 shall remain unaffected; these Examination Regulations shall then be adopted ex officio on April 1, 2023.

(4) The Examination Organization Regulations of the Faculty of Agriculture (POO-LWF), as amended, govern the subject-specific and administrative organization of examination procedures in this degree program.

§ 1a
Coronavirus pandemic

If the Rectorate has made use of the authorization to issue provisions concerning academic studies that it was granted under the Ordinance on Overcoming Coronavirus SARS-CoV-2 Epidemic-Related Challenges Posed on University Operations (*Corona-Epidemie-Hochschulverordnung*) dated April 15, 2020, as amended, which was issued based on § 82a of the NRW Higher Education Act, the provisions issued by the Rectorate shall supersede the corresponding provisions in these Examination Regulations.

Part 2
Academic degree

§ 2
Academic degree

Candidates who successfully complete the master's examination for the Geodetic Engineering degree program shall be awarded a Master of Science (MSc) degree by the Faculty of Agriculture of the University of Bonn.

Part 3
Admission requirements, program structure and module examinations (registration/withdrawal)

§ 3
Degree program admission requirements

(1) The consecutive master's degree program Geodetic Engineering is open to applications from graduates from a university undergraduate degree program in the field of geodesy or a related field.

(2) The university degree in para. 1 must provide proof of the following qualifications:

- A total of at least 24 ECTS CP in at least two of the following fields:
  - Mathematics
  - Physics
  - Programming

and

- a total of at least 48 ECTS CP in at least two of the following six fields:
  - Field 1: physical geodesy, space geodesy, geodynamics and earth systems research
  - Field 2: data analysis, modeling and scientific computation in the geosciences context
  - Field 3: photogrammetry, remote sensing, computer vision and robotics
  - Field 4: geodetic measuring technology, engineering geodesy and satellite measuring technology
  - Field 5: algorithmics, spatial databases, geoinformation and geoinformation systems
  - Field 6: urban development, land division, real estate valuation and land management

(3) English skills at level B2 or higher according to the Common European Framework of Reference for Languages (CEFR) are a prerequisite for admission to the degree program and are to be proved by submitting a recognized language certificate (e.g. TOEFL, IELTS) or equivalent proof.

(4) This does not affect admission restrictions due to capacity limits (*numerus clausus*).

§ 4
Standard period of study, ECTS credit point system, range of courses, program structure and language of instruction/examinations

(1) This degree program is only open to full-time students. The standard period of study, including the master's thesis, is four semesters (120 ECTS CP).

(2) The degree program includes

1. 60 ECTS CP for compulsory modules, consisting of
   - 18 ECTS CP for general compulsory modules; and
   - 42 ECTS CP for profile-specific compulsory modules (including 24 ECTS CP for project modules);
2. 30 ECTS CP for elective modules; and
3. 30 ECTS CP for the master's thesis.

Details on modules, admission to courses and the amount of ECTS credit points per module are set forth in the module structure (Annex).

(3) The profile-specific compulsory modules (including project modules) and elective modules are assigned to the following degree profiles:

- Mobile Sensing and Robotics (MSR)
- Geodetic Earth System Science and Data Analysis (GES) or
- Geoinformation and Spatial Development (GSD)

(4) Students must choose one of the degree profiles in paragraph 3 as their major profile and another as their minor profile at the beginning of the first semester. Students may only change their choice once in the

first semester by submitting a written request, which is irrevocable, before the first examination in one of the degree profiles.

(5) Students must earn the following number of credit points for profile-specific compulsory modules:
- 36 ECTS CP in the major profile (including 24 ECTS CP for project modules) and
- 6 ECTS CP in the minor profile

(6) For elective modules:
- At least 18 ECTS CP and at most 30 ECTS CP must be earned in the major profile.
- Up to 12 ECTS CP can be earned in the minor profile.

(7) The language of instruction and examinations is English.

(8) The degree program starts in the winter semester of each year.

(9) A vocational internship is recommended to complement the academic training.

§ 5
Module examinations—registration and withdrawal

(1) Students who have withdrawn from a module examination in accordance with § 12, para. 3 of the POO-LWF must register electronically again with the examination board for the module examination. Where justified, registrations may be submitted in writing.

(2) Students should register to resit a failed module examination on the next scheduled examination date themselves.

(3) In all other respects, the provisions of § 12 of the POO-LWF shall apply.

Part 4
Repeating examinations and pass requirements for the master's examination

§ 6
Repeating examinations

(1) Examinations that have been failed may only be repeated twice. If the options for resitting an examination in a module have been exhausted, the candidate shall have failed their final attempt at the module. Rules for repetition of the master's thesis are defined in § 23, para. 7 of the POO-LWF.

(2) Students who fail their final attempt to pass a compulsory module lose their right to examination and are deregistered from the degree program by the Student Registry once the examination board's decision that the final attempt at the master's examination has been failed has come into force.

(3) If the final attempt at an elective module has been failed, the candidate can choose another, previously unchosen elective module as compensation. Such compensation is only possible a total of four times. Students who use all their compensation options without success lose their right to examination and are deregistered from the degree program by the Student Registry once the examination board's decision that the final attempt at the master's examination has been failed has come into force.

(4) Examinations graded "sufficient" or higher cannot be repeated.

(5) For modules with examinations that are taken during the semester or that are part of a course, the examination cannot be repeated in the same semester. The examination can only be repeated in such

modules by retaking the entire module or corresponding course. The examination board shall announce the respective examinations and coursework to be repeated before the beginning of the semester, pursuant to § 8, para. 8 of the POO-LWF.

§ 7
Pass requirements for the master's examination

(1) Candidates shall have passed the master's examination when they have passed all necessary modules as per § 4, para. 2, including the master's thesis, with a grade of "sufficient" or higher and have thus been awarded a total of 120 ECTS CP.

(2) The final attempt at the master's examination shall be deemed failed when

- the final attempt at a compulsory module has failed according to the provisions of § 6, para. 1 and 2; or
- the final attempt at an elective module has failed in accordance with § 6, para. 1 and para. 3, sentence 1, and the compensation options have been used without success in accordance with § 6, para. 3, sentence 2 and 3; or
- the master's thesis has been graded "insufficient" in the second attempt in accordance with § 23, para. 7 of the POO-LWF.

Part 5
Entry into force

§ 8
Entry into force and publication

(1) These Examination Regulations shall enter into force on the day after their publication in the Official Announcements of the University of Bonn.

(2) Under § 12, para. 5 of the NRW Higher Education Act, violations of the procedural or formal requirements of the Higher Education Act or regulatory or other legal provisions of the University of Bonn may no longer be asserted against these Regulations if one year has passed since their announcement.

T. Heckelei

The Dean
of the Faculty of Agriculture
of the University of Bonn
Professor Dr. Thomas Heckelei

Executed pursuant to the resolution adopted by the Faculty Council of the Faculty of Agriculture on September 30, 2020 and the resolution passed by the Rectorate on October 6, 2020.

Bonn, October 16, 2020

M. Hoch

The Rector
of the University of Bonn
Professor Dr. Dr. h. c. Michael Hoch

Annex: Module structure for the consecutive master's degree program Geodetic Engineering

Module structure key:

- Abbreviations of course types: GS = guided independent study, F = field trip, I = internship, prE = practical exercise, S = seminar, T = tutorial, E = scientific exercise, L = lecture.
- Marked with asterisk (*): courses that require compulsory attendance as a prerequisite for participation in the module examination in accordance with § 13, para. 6 of the POO-LWF. In these cases, compulsory attendance is an additional requirement to the other coursework listed.
- The "Course Type" column shows the type of a course within the module.
- The "Duration/Program-Related Semester" column shows the duration of the module (in semesters) and assigns it to a specific program-related semester (PRS).
- The "Coursework" column shows requirements that must be met for admission to certain examinations pursuant to § 13, para. 4 of the POO-LWF or, respectively, to acquire ECTS credit points in modules without an examination.

Further details on individual modules, especially regarding the courses offered within or required for completion of a module, are described in the module guide, which the examination board will make available before the beginning of the respective semester, pursuant to § 8, para. 8 of the POO-LWF.

A.1 General compulsory modules (18 ECTS CP)

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-01	Coordinate Systems	L, E	None	1 semester 1st PRS	**Subject of examination:** Local and global coordinate systems, transformations, reference systems and reference frames, coordinate systems in cartography and GIS **Qualification objective:** In-depth understanding and use of different 3D coordinate systems	Written and/or oral requirements	Written examination	3

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-02	Global Navigation Satellite Systems	L, prE*	None	1 semester 1st PRS	**Subject of examination:** Satellite navigation systems, GNSS signals and receiver technology, positioning methods, applications **Qualification objective:** In-depth knowledge of the physical, functional and stochastic characteristics of satellite-based positioning methods and systems	Written and/or oral requirements	Written examination	3
MGE-03	Statistics and Adjustment Theory	L, E	None	1 semester 1st PRS	**Subject of examination:** Least squares estimation, regression analysis, probability theory, best linear unbiased estimator, confidence regions, hypothesis testing **Qualification objective:** In-depth understanding of parameter estimation and hypothesis testing concepts	Written and/or oral requirements	Written examination	3
MGE-04	Computational Foundations of GIS	L, E	None	1 semester 1st PRS	**Subject of examination:** Basics of geoinformation systems, models, referencing objects, metric spaces, topological spaces and topological relationships, object-oriented modeling, spatial databases and queries, geometric algorithms for spatial analysis **Qualification objective:** In-depth understanding of how to use geoinformation systems to analyze spatial data; use and design of different data formats for spatial databases	Written and/or oral requirements	Oral examination	3

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-05	Geodetic Earth Observation	L, E	None	1 semester 1st PRS	**Subject of examination:** Concepts of global reference systems and reference frames, earth rotation, concepts for reference ellipsoids, geoids and gravity fields, satellite orbits for geodesy and remote sensing, basics of space geodetic observation techniques, atmosphere; time measurement systems; space environment **Qualification objective:** In-depth understanding of the concepts of global geodesy and geodetic earth observation	Written and/or oral requirements	Oral examination	3
MGE-06	Profile Fundamentals	GS	None	1 semester 1st PRS	**Subject of examination:** Selected course content chosen according to student skills for the desired profile **Qualification objective:** Supplementary learning objectives based on student skills for the desired profile	The credit points are awarded for fully completed exercises.	None	3

A.2 Profile-specific compulsory modules (42 ECTS CP, of which 36 ECTS CP are in the major profile—including 24 ECTS CP for project modules—and 6 ECTS CP in the minor profile)

Mobile Sensing and Robotics (MSR) degree profile

a) as major profile (project modules: MGE-MSR-P-I and MGE-MSR-P-II)

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-MSR-01	Sensors and State Estimation	L, prE*	None	1 semester 1st PRS	**Subject of examination:** State estimation, smoothing and filtering methods for determining motion and pose. **Qualification objective:** Detailed, comprehensive, specialized knowledge of the state-of-the-art in geodesy and robotics.	Written and/or oral requirements	Oral examination	6
MGE-MSR-02	Advanced Techniques for Mobile Sensing and Robotics	L, prE*	None	1 semester 2nd PRS	**Subject of examination:** Advanced state estimation, smoothing and filtering methods for motion estimation and mapping the observed environment **Qualification objective:** Specialized technical skills for also solving strategic problems in the area of geodesy and robotics	Written and/or oral requirements	Oral examination	6
MGE-MSR-P-I	Mobile Sensing and Robotics – Part I	E, prE*, S*	MGE-06 and three other general or profile-specific compulsory modules from the MSR degree profile	1 semester 2nd PRS	**Subject of examination:** Analysis, specification and handling of special interdisciplinary research-related topics and questions in the area of the Mobile Sensing and Robotics profile **Qualification objective:** Define objectives for new research and application-oriented tasks in the fields of geodesy and robotics and apply appropriate methods; independently acquire the knowledge required for this	Written and/or oral requirements	Project report	12

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-MSR-P-II	Mobile Sensing and Robotics – Part II	E, prE*, S*	MGE-MSR-P-I	1 semester 3rd PRS	**Subject of examination:** In-depth analysis, specification and handling of special interdisciplinary research-related topics and questions in the area of the Mobile Sensing and Robotics profile **Qualification objective:** Responsibly lead groups for complex tasks in the areas of geodesy and robotics and act as a representative for the results of their work; lead area-specific and cross-area discussions	Written and/or oral requirements	Project report, report (weighting: 1:1)	12

b) as minor profile

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-MSR-01	Sensors and State Estimation	L, prE*	None	1 semester 1st PRS	**Subject of examination:** State estimation, smoothing and filtering methods for determining motion and pose **Qualification objective:** Detailed, comprehensive, specialized knowledge of the state-of-the-art in geodesy and robotics	Written and/or oral requirements	Oral examination	6

Geodetic Earth System Science and Data Analysis (GES) degree profile

a) as major profile (project modules: MGE-GES-P-I and MGE-GES-P-II)

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GES-01	Satellite Geodesy and Earth System	L, E, prE*	None	1 semester 1st PRS	**Subject of examination:** Satellite and space geodesy methods, use of the main satellite techniques for earth system research **Qualification objective:** Detailed, comprehensive, specialized knowledge of the state-of-the-art in physical geodesy and geostatistics	Written and/or oral requirements	Oral examination	6
MGE-GES-02	Advanced Data Analysis	L, E	None	1 semester 2nd PRS	**Subject of examination:** In-depth knowledge of physical geodesy methods, use of the main data analysis methods for physical geodesy problems; geostatistics methods with a focus on deterministic and stochastic approaches **Qualification objective:** Specialized technical skills for also solving strategic problems in the area of physical geodesy and geostatistics	Written and/or oral requirements	Oral examination	6
MGE-GES-P-I	Geodetic Earth System Science and Data Analysis – Part I	E, prE*, S*	MGE-06 and three other general or profile-specific compulsory modules from the GES degree profile	1 semester 2nd PRS	**Subject of examination:** Analysis, specification and handling of special interdisciplinary research-related topics and questions in the area of the Geodetic Earth System Science and Data Analysis profile **Qualification objective:** Define objectives for new research and application-oriented tasks in the fields of physical geodesy and geostatistics and apply appropriate methods; independently acquire the knowledge required for this	Written and/or oral requirements	Project report	12

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GES-P-II	Geodetic Earth System Science and Data Analysis – Part II	E, prE*, S*	MGE-GES-P-I	1 semester 3rd PRS	**Subject of examination:** In-depth analysis, specification and handling of special interdisciplinary research-related topics and questions in the area of the Geodetic Earth System Science and Data Analysis profile **Qualification objective:** Responsibly lead groups for complex tasks in the areas of physical geodesy and geostatistics and act as a representative for the results of their work; lead area-specific and cross-area discussions	Written and/or oral requirements	Project report, report (weighting: 1:1)	12

b) as minor profile

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GES-01	Satellite Geodesy and Earth System	L, E, prE*	None	1 semester 1st PRS	**Subject of examination:** Satellite and space geodesy methods, use of the main satellite techniques for earth system research **Qualification objective:** Detailed, comprehensive, specialized knowledge of the state-of-the-art in physical geodesy and geostatistics	Written and/or oral requirements	Oral examination	6

Geoinformation and Spatial Development (GSD) degree profile

a) as major profile (project modules: MGE-GSD-P-I and MGE-GSD-P-II)

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GSD-01	Urban Development	L, E	None	1 semester 1st PRS	**Subject of examination:** Current trends, drivers and problem areas in urban development, urban development theory and models **Qualification objective:** Detailed, comprehensive, specialized knowledge of the state-of-the-art in geoinformation and urban development	Written and/or oral requirements	Oral examination	6
MGE-GSD-02	Spatial Decision Support Systems	L, prE*	None	1 semester 2nd PRS	**Subject of examination:** Decision-making theory for planning decisions; abstraction and solution of spatial data problems **Qualification objective:** Specialized technical skills for also solving strategic problems in the area of geoinformation and urban development	Written and/or oral requirements	Written examination	6
MGE-GSD-P-I	Geoinformation and Spatial Development – Part I	E, prE*, S*	MGE-06 and three other general or profile-specific compulsory modules from the GSD degree profile	1 semester 2nd PRS	**Subject of examination:** Analysis, specification and handling of special interdisciplinary research-related topics and questions in the area of the Geoinformation and Spatial Development profile. **Qualification objective:** Define objectives for new research and application-oriented tasks in the fields of geoinformation and urban development, with reflection on possible social and cultural impacts and apply appropriate methods; independently acquire the knowledge required for this	Written and/or oral requirements	Project report	12

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GSD-P-II	Geoinformation and Spatial Development – Part II	E, prE*, S*	MGE-GSD-P-I	1 semester 3rd PRS	**Subject of examination:** In-depth analysis, specification and handling of special interdisciplinary research-related topics and questions in the area of the Geoinformation and Spatial Development profile **Qualification objective:** Responsibly lead groups for complex tasks in the areas of geoinformation and urban development and act as a representative for the results of their work; lead area-specific and cross-area discussions	Written and/or oral requirements	Project report, report (weighting: 1:1)	12

b) as minor profile

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GSD-01	Urban Development	L, E	None	1 semester 1st PRS	**Subject of examination:** Current trends, drivers and problem areas in urban development, urban development theory and models **Qualification objective:** Detailed, comprehensive, specialized knowledge of the state of the art in geoinformation and urban development	Written and/or oral requirements	Oral examination	6

B. Elective modules (30 ECTS CP)

Elective modules can be chosen from up to two of the three degree profiles, namely the major and minor profiles selected in accordance with § 4, para. 4. Modules worth 18 to 30 ECTS CP must be completed in the major profile and modules worth up to 12 ECTS CP can be completed in the minor profile.

The examination board may approve further elective modules and shall announce them before the beginning of the semester pursuant to § 8, para. 8 of the POO-LWF.

Mobile Sensing and Robotics (MSR) degree profile

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-MSR-03	Selected Topics of Robotics	L, prE*, S*	None	1 semester 2nd PRS	**Subject of examination:** In-depth knowledge of special research-related topics and questions in the area of robotics **Qualification objective:** Critical understanding of the main theories, principles and methods in the area of robotics; ability to independently acquire more in-depth knowledge	Written and/or oral requirements	Oral examination	6
MGE-MSR-04	Selected Topics of Mobile Sensing	L, prE*, S*	None	1 semester 2nd PRS	**Subject of examination:** In-depth knowledge of special research-related topics and questions in the area of mobile sensing **Qualification objective:** Critical understanding of the main theories, principles and methods in the area of mobile sensing; ability to independently acquire more in-depth knowledge	Written and/or oral requirements	Term paper, presentation (3:1)	6

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-MSR-05	Advanced Research Topics of Mobile Sensing	L, prE*, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of mobile sensing **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of mobile sensing; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Term paper, presentation (3:1)	6
MGE-MSR-06	Advanced Research Topics of Robotics	L, prE*, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of robotics **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of robotics; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Oral examination	6
MGE-MSR-07	Advanced Research Topics of Mobile Sensing and Robotics	L, prE*, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of mobile sensing and robotics **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of mobile sensing and robotics; derive scientifically sound judgments and independently design advanced learning processes.	Written and/or oral requirements	Term paper, presentation (3:1)	6

Geodetic Earth System Science and Data Analysis (GES) degree profile

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GES-03	Selected Topics of Geodetic Earth System Science	L, prE*, S*	None	1 semester 2nd PRS	**Subject of examination:** In-depth knowledge of special research-related topics and questions in the area of astronomical, physical and mathematical geodesy **Qualification objective:** Critical understanding of the main theories, principles and methods in the area of astronomical, physical and mathematical geodesy; ability to independently acquire more in-depth knowledge	Written and/or oral requirements	Oral examination	6
MGE-GES-04	Selected Topics of Data Analysis	L, prE*, S*	None	1 semester 2nd PRS	**Subject of examination:** In-depth knowledge of special research-related topics and questions in the area of statistics and data analysis **Qualification objective:** Critical understanding of the main theories, principles and methods in the area of statistics and data analysis; ability to independently acquire more in-depth knowledge	Written and/or oral requirements	Term paper, presentation (3:1)	6

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GES-05	Advanced Research Topics of Geodetic Earth System Science	L, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of astronomical, physical and mathematical geodesy **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of astronomical, physical and mathematical geodesy; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Term paper, presentation (3:1)	6
MGE-GES-06	Advanced Research Topics of Data Analysis	L, prE*, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of statistics and data analysis **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of statistics and data analysis; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Oral examination	6

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GES-07	Advanced Research Topics of Geodetic Earth System Science and Data Analysis	L, prE*, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of astronomical, physical and mathematical geodesy and statistics and data analysis **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of astronomical, physical and mathematical geodesy and statistics and data analysis; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Oral examination	6

Geoinformation and Spatial Development (GSD) degree profile

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GSD-03	Selected Topics of Spatial Development	L, E, S*	None	1 semester 2nd PRS	**Subject of examination:** In-depth knowledge of special research-related topics and questions in the area of urban development **Qualification objective:** Critical understanding of the main theories, principles and methods in the area of urban development; ability to independently acquire more in-depth knowledge	Written and/or oral requirements	Oral examination	6
MGE-GSD-04	Selected Topics of Geoinformation	L, prE*, S*	None	1 semester 2nd PRS	**Subject of examination:** In-depth knowledge of special research-related topics and questions in the area of geoinformation **Qualification objective:** Critical understanding of the main theories, principles and methods in the area of geoinformation; ability to independently acquire more in-depth knowledge	Written and/or oral requirements	Term paper, presentation (3:1)	6
MGE-GSD-05	Advanced Research Topics of Spatial Development	L, E, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of urban development **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of urban development; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Term paper, presentation (3:1)	6

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-GSD-06	Advanced Research Topics of Geoinformation	L, prE*, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of geoinformation **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of geoinformation; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Oral examination	6
MGE-GSD-07	Advanced Research Topics of Geoinformation and Spatial Development	L, prE*, S*	None	1 semester 3rd PRS	**Subject of examination:** Advanced knowledge of special research-related topics and questions in the area of geoinformation and urban development **Qualification objective:** Ability to independently collect, evaluate and interpret relevant information in the area of geoinformation and urban development; derive scientifically sound judgments and independently design advanced learning processes	Written and/or oral requirements	Oral examination	6

C. Master's thesis (30 ECTS CP)

Module Number/ Identifier	Module Name	Course Type	Admission Requirements	Duration and Program-Related Semester	Subject (Content) of Examination and Qualification Objective	Coursework	Type of Examination	ECTS CP
MGE-MT	Master's Thesis	-	all compulsory modules (60 ECTS CP)	1 semester 4th PRS	**Subject of examination:** Analysis and specification of tasks; independently solve a complex task using scientific methods within a specified period of at least four and at most six months; present the results in a form that satisfies the requirements **Qualification objective:** Students are able to - analyze, specify, structure and solve a complex task using scientific methods within a specified period of time; - write a scientific paper; - prepare an English summary; - prepare a concise, explicit summary in the form of a scientific poster; - present and discuss the results of their work in an expert talk.	None	Master's thesis (including presentation)	30