TECHNISCHE UNIVERSITÄT WIEN

Bachelor's

Master's

Doctorate

University Certificate Program

Curriculum (Study Plan) for the

Master's Program Geodesy and Geoinformation UE 066 421

Vienna University of Technology

Resolution of the Senate of the Vienna University of Technology

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§ 1 Basis and Scope of Application

This curriculum sets out and governs the engineering-focused, English-taught master's program *Geodesy and Geoinformation* at TU Wien (Vienna University of Technology). It is based on the Austrian Universities Act 2002, Federal Law Gazette I No. 120/2002 (UG), and the section of TU Wien's statutes titled *Study Law Provisions* as amended from time to time. The structure and design of the program follow the qualification profile set out below.

§ 2 Qualification Profile

The master's program *Geodesy and Geoinformation* provides an advanced, scientifically rigorous and methodologically strong education designed for lasting expertise. It prepares graduates both for further academic development—especially within a relevant doctoral program—and for employment in, for example, the following fields of activity, enabling them to compete internationally:

- Engineering Consultant_in for Surveying.
- Independent planning, management, and execution of demanding surveying projects in coordination with other engineering disciplines such as civil engineering, geotechnical engineering, or mechanical engineering.
- Leadership roles in public authorities and organizations involved in the acquisition, administration, or use of geodata, including its cartographic communication.
- Leadership roles in the development of instruments or software for acquiring and processing geodata.
- Independent planning, management, and execution of complex geodata management tasks in the context of spatial questions across a wide range of disciplines.

As challenges continue to grow in resource management, the development of urban and natural spaces, environmental protection, and climate change, modern society depends on reliable information about the underlying processes and how they interact. That is why the ability to capture, model, connect, and communicate spatial data plays a key role. The program has an international focus, aligning its content with real-world tasks as well as the needs of students and the job market.

In response to professional requirements, the master's program *Geodesy and Geoinformation* provides qualifications in the following categories.

Subject-Specific and Methodological Competencies

- Advanced knowledge of least-squares adjustment
- Advanced knowledge of methods and sensors in engineering geodesy

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- Knowledge of construction law, plus basic familiarity with land registry law and the surveying act
- Gravity Field Theory 4
- Theory and practice of geodetic space-based methods and atmospheric influences
- Theory of Earth's rotation and geodynamic processes
- Advanced expertise in photogrammetry and remote sensing
- Analysis and integration of spatial information
- Advanced knowledge of cartography

Cognitive and practical skills

- Ability to independently plan and carry out demanding technical tasks in surveying and geoinformation
- Critical engagement with current professional literature, especially English-language sources
- Presenting and discussing one's own work and the work of others
- Project execution and working effectively under time pressure
- Writing academic papers

Social and self-management skills

- Leading teams in the execution of demanding technical tasks
- Critically evaluating given requirements and framework conditions, and developing practical proposals for adjustment (consulting)
- Graduat_es can work effectively in multicultural teams and, through instruction conducted in English, possess the relevant technical vocabulary in English
- Dealing with conflicting information
- Cost and quality awareness

§ 3 Duration and Scope

The workload for the master's program *Geodesy and Geoinformation* is 120 ECTS credits. This corresponds to an expected full-time program length of 4 semesters.

ECTS credits (ECTS) measure students' workload. One academic year comprises 60 ECTS credits, with 1 ECTS credit corresponding to 25 hours of work (pursuant to § 54(2) UG).

§ 4 Admission to the Master's Program

Admission to the master's program *Geodesy and Geoinformation* requires completion of a relevant bachelor's degree program or another relevant degree program at least at the same higher-education level from a

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from a recognized postsecondary institution in Austria or abroad. Relevant prior studies include foundational scientific disciplines such as mathematics and physics, or computer science. In any case, the bachelor's program in *Geodesy and Geoinformation* at TU Wien and the bachelor's program in *Geodesy* at TU Graz are considered relevant.
To make up for significant subject-specific differences, supplementary examinations totaling up to 30 ECTS credits may be required; these must be completed by the end of the second semester of the master's program.
The language of instruction is English. Applicants_whose first language is not English must provide proof of the required language proficiency. The accepted form of proof is specified in a rectorate regulation.
English proficiency is considered demonstrated if the requirements of the rectorate regulation on the language skills and evidence required for admission to degree programs are met, or if relevant English-taught courses were completed during the bachelor's program. No German proficiency is required to complete this program. However, for students aiming for a career as an_engineering consultant_in surveying, German skills are recommended, since the relevant elective courses (see Appendix F) are offered only in German.

§ 5 Program Structure

The program's content and learning outcomes are delivered through *modules*. A module is a teaching and learning unit defined by entry and exit competencies, content, teaching and learning methods, the standard workload, and the assessment format. Modules are completed through one or more thematically connected *courses*. Modules covering similar topics are grouped into *exam subjects*, whose title, scope, and overall grade are listed on the final degree certificate.

Exam Subjects and Associated Modules

The master's program *Geodesy and Geoinformation* is organized into the exam subjects listed below, along with the modules assigned to each.

In-Depth Study of Fundamentals (12.0 ECTS)

Parameter Estimation (6.0 ECTS)
Seminars (6.0
ECTS)

Specialization in Geodesy and Geoinformation (44.0–54.0 ECTS)

As part of the examination subject *Specialization in Geodesy and Geoinformation* , courses from the following modules must be completed totaling at least

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Complete 44 ECTS, up to a maximum of 54 ECTS:

Applied Geoinformation (8.0 ECTS)
Applied Cartography (7.5 ECTS)
Earth Observation (7.5 ECTS)
Climate and Environmental Remote Sensing (6.0–8.0 ECTS)
Space Geodesy (9.0 ECTS)
Advanced Engineering Geodesy (9.0 ECTS)
Real Estate and Cadastre (7.5 ECTS)
Microwave Remote Sensing (6.0 ECTS)
Advanced Photogrammetry (6.0 ECTS)
Law and Economics (5.0 ECTS)
Gravity Field and Earth Rotation (9.0 ECTS)
Statistical Pattern Recognition (6.0 ECTS)
Theoretical Cartography (6.0–9.0 ECTS)
Geoinformation Theory (8.0 ECTS)

Broadening in Geodesy and Geoinformation (15.0–25.0 ECTS)

Within the examination subject *Broadening in Geodesy and Geoinformation* , courses from the modules listed below must be completed for a total of at least 15 ECTS and no more than 25 ECTS, so that—together with the examination subject *Specialisation in Subjects of Geodesy and Geoinformation* —a minimum of 70 ECTS has been completed:

Area-Based and Kinematic Measurement Methods in Engineering Geodesy (6.0 ECTS)
Geo-Data and Data Processing (6.0–9.0 ECTS)
Supplementary Mathematics (5.5–8.5 ECTS)
Supplementary Specialization (4.0–10.0 ECTS)
Environment (6.0–9.0 ECTS)
Environmental Geophysics (6.5–9.5 ECTS)
Navigation and Space (7.5–10.5 ECTS)

Within the *Supplementary Specialization* module, you may also complete courses from other modules, provided they are not being used to fulfill those modules' requirements. With approval from the responsible academic authority, you may also take courses with no established equivalencies—provided they offer meaningful academic depth—during a study-abroad stay (e.g., through the ERASMUS program).

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Elective Courses and Transferable Skills (9.0 ECTS)

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Courses for the Elective Courses and Transferable Skills module may be freely selected from the offerings of all recognized universities in Austria and abroad; however, at least 4.5 ECTS must be completed in the area of Transferable Skills. This also includes all courses in the *Seminars* module. If courses from other modules are completed for more ECTS than required for those modules, the number of ECTS to be completed in the *Elective Courses and Transferable Skills* module is reduced by the same amount; however, a total of 4.5 ECTS in topics within Transferable Skills must be completed within the master's program in any case.

Master's Thesis (30.0 ECTS)

See Section § 9.

Brief Module Descriptions

This section provides a brief overview of the modules in the master's program *Geodesy and Geoinfor-mation* . A detailed description can be found in Appendix A.

Parameter Estimation (6,0 ECTS) The Parameter Estimation module begins with the standard least-squares method and explores challenges and issues associated with it. Key topics include quality considerations, detecting gross errors using robust estimation, and a range of applications relevant to geodesy and geoinformation. In addition, statistical analysis is expanded from handling single values to modeling spatially distributed phenomena.

Seminars (6,0 ECTS) The introductory seminar in this module supports students in developing an individualized master's study plan. The remaining seminars focus on researching existing literature on a specific topic and presenting a clear overview of the results to an audience. Another emphasis is on active, critical listening and thoughtful participation in scientific presentations.

Electives and Transferable Skills (9,0 ECTS) The courses in this module are intended to deepen subject expertise while also building interdisciplinary knowledge, skills, competencies, and transferable skills. Courses may be selected from the offerings of any recognized domestic or international postsecondary institution.

Applied Geoinformation (8.0 ECTS) This module explores modern approaches to storing, retrieving, and analyzing data, including non-relational databases, distributed systems, and web-based solutions. Emphasis is placed on choosing the right tools for a real-world problem and implementing an information system as a prototype.

Applied Cartography (7.5 ECTS) The Applied Cartography module focuses on using cartographic methods to create maps and cartographic visualizations

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in ways that are appropriate for the medium. Particular emphasis is placed on combining skills in data management, the use of different media, and cartographic design.

Climate and Environmental Remote Sensing (6,0 -8,0 ECTS) This module offers insight into the mechanisms and drivers behind Earth system variability and change across time and space. It highlights how Earth observation can be used to measure these dynamics, build statistical forecasting models, and enhance existing process-based models through model–data integration.

Earth Observation (7,5 ECTS) The Earth Observation module focuses on using sensors on spaceborne, airborne, and ground-based platforms to collect data on Earth's physical, chemical, and biological systems. Emphasis is placed on applying remote sensing and photogrammetric methods to derive geophysical variables from measurements across the optical, infrared, and microwave spectrum.

Space Geodesy (9,0 ECTS) This module covers space-geodetic methods such as Very Long Baseline Interferometry (VLBI) and Global Navigation Satellite Systems (GNSS). Special attention is given to atmospheric propagation delays affecting signals from extragalactic radio sources and satellites, as well as to VLBI experiments, including their technical aspects.

Advanced Engineering Geodesy (9,0 ECTS) This module addresses common sensor systems, measurement workflows, and methods used in engineering geodetic monitoring. Alongside the theoretical foundations, hands-on exercises demonstrate how to operate the sensor systems and work with specialized software.

Property and Cadastre (7,5 ECTS) Introduction to legal topics relevant to surveying, with a focus on the Austrian legal framework. Covered are general legal concepts, the cadastre, the land register, the property database, zoning and development plans, and subdivision plans.

Microwave Remote Sensing (6,0 ECTS) This module examines active and passive microwave remote sensing methods and their applications. Starting from core physical principles, it explores different measurement approaches and how microwave signals interact with natural features such as soil, vegetation, water, and ice.

Advanced Photogrammetry (6,0 ECTS) Advanced Photogrammetry aims to develop a deep understanding of observations and parameter estimation in photogrammetry using cameras and laser scanners. Building on this foundation, solutions to complex photogrammetric problems are presented and evaluated. Exercises reinforce the material and translate it into practice.

Law and Economics (5,0 ECTS) This module covers business and legal fundamentals relevant to running a civil engineering consultancy office, along with the basics of Austrian construction and planning law.

Gravity Field and Earth Rotation (9,0 ECTS) The gravity field is not perfectly spherically symmetric, and Earth does not rotate on its axis in exactly 24 hours. This

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This module explores the theory and observation of the gravity field, Earth's rotation, and how these factors influence one another. Global dynamic processes play a key role in both.

Statistical Pattern Recognition (6,0 ECTS) This module has three goals: I) Review and reinforce the fundamentals of statistics and probability (from both frequentist and Bayesian perspectives), including distributions, estimation theory, and hypothesis testing. II) Introduce the basics of decision theory and classification. III) Explore applications of these topics, ranging from dimensionality reduction with PCA to handling confounding effects through regression.

Theoretical Cartography (6,0 – 9,0 ECTS) This module examines the key paradigms of scientific cartography, current schools of thought, the resulting body of knowledge, and ongoing research directions. Emphasis is placed on applying theory to support research-focused work.

Geoinformation Theory (8,0 ECTS) This module covers the core theories behind geoinformation systems, including computational geometry, relational algebra, and a range of algorithms and their implementation. The emphasis is on efficient handling of space and time, access methods, and solution strategies, and how these are applied to spatial problems.

Areal and Kinematic Measurement Methods in Engineering Geodesy (6,0 ECTS) This module presents foundational and advanced concepts for areal and kinematic measurement and analysis, taught with a research-oriented perspective. Hands-on demonstrations and in-house developments are used to clarify concepts and connect theory with practice.

Geo-Data and Data Processing (6,0 – 9,0 ECTS) Using (geo-)data effectively requires understanding the task at hand, the available data, and the ability to define and assess data quality. This module's courses address data-quality concepts, statistical computing, and the processing and visualization of data across multiple geo-data types, including point clouds and vector data.

Supplementary Mathematics (5,5 – 8,5 ECTS) This module offers an introduction to discrete mathematics and numerical computation.

Supplementary Specialization (4,0 – 10,0 ECTS) An additional specialization that extends beyond the content of the other selected specialization modules. Any course explicitly listed in this curriculum that is completed outside of its associated module is still recognized as a course.

Environment (6,0 – 9,0 ECTS) This module covers the physics of Earth's atmosphere, climate-relevant physical relationships, geodetic methods for detecting environmental change, and legal areas relevant to environmental protection.

Environmental Geophysics (6,5 – 9,5 ECTS) Many of the processes that sustain life as we know it take place in soil—from plant growth to the storage of organic carbon and water. Environmental Geophysics offers a broad set of methods

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that let us explore subsurface processes without disturbing them. This module reviews these geophysical techniques and the key physical properties involved, with a special emphasis on understanding biogeochemical processes.

Navigation and Space (7,5 – 10,5 ECTS) Navigation plays a vital role in everyday life. This module covers a range of positioning and navigation techniques, with an emphasis on satellite-based methods such as Global Navigation Satellite Systems (GNSS). It also provides an introduction to astronomy and includes an excursion to a space geodetic observatory.

§ 6 Courses

The subject areas of the modules are taught through courses. The courses for each module are specified in Appendix A within the respective module descriptions. Courses are assessed through examinations as defined by the Universities Act. The types of course assessments are set out in the Examination Regulations (§ 7).

With regard to the Study Commission's option to expand modules by adding courses for a semester, and the academic affairs body's option to assign courses to elective modules on an individual basis for specific students, reference is made to § 27 of the study-law section of the TU Wien statutes.

Requirements for Courses and Examinations under the 2002 Universities Act

Before the start of each semester, an electronic course catalog must be published (title, name of the course instructor, type, format including location, and course dates). It must be kept up to date on an ongoing basis.
In addition to the published catalog, course instructors must, before the start of each semester, inform students in an appropriate manner about the objectives, format, content, dates, and methods of their courses, as well as about the content, format, methods, dates, grading criteria, and grading standards of the examinations.

For exams conducted as a single assessment, exam dates must be scheduled at least three times each semester (as set out in the statutes: at the beginning, mid-semester, and at the end). Students must be informed before the start of each semester about the exam content, format, methods, dates, grading criteria, and grading standards.

For exams conducted using electronic communication tools, proper administration of the exam must be ensured. In addition to the general exam rules, the following minimum requirements must be met:

- Before the semester begins, publish the standards that students' technical devices must meet in order to participate in these exams

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- To ensure that students complete the exam independently, appropriate technical or organizational measures must be put in place. 11

- If technical issues occur through no fault of the student, the exam must be discontinued and must not count toward the permitted number of exam attempts.

Requirements for Courses Under the TU Wien Statutes

In the following, SSB stands for *TU Wien Statutes, Study Law Provisions.*

- The scope of a course must be stated in ECTS credits and in semester hours. [§ 9 SSB (Modules and Courses)]
- Offering a course as a "block course" is possible with approval from the Vice Dean/Dean of Studies. [§ 9 SSB (Modules and Courses)]
- Offering courses and exams in a foreign language is possible with approval from the Vice Dean/Dean of Studies. [§ 11 SSB (Foreign Languages)]
- Course exams are used to demonstrate the learning outcomes taught in a single course. [§ 12 SSB (Course Exam)]
- Course exams must be administered by the course instructor. If necessary, the academic body responsible for study law must appoint another suitably qualified examiner. [§ 12 SSB (Course Exam)]
- In any case, for exams in required and required-elective courses that conclude with a single exam sitting, three exam dates must be scheduled—at the beginning, mid-point, and end of each semester. These must be announced with dates before the semester begins. [§ 15 SSB (Exam Dates)]
- Exams may also be held at the start and end of periods without classes. [§ 15 SSB (Exam Dates)]
- The exam dates must be announced in an appropriate manner. [§ 15 SSB (Exam Dates)]

Description of Course Types

LEC: Lectures are courses in which the content and methods of a subject are presented, with particular attention to its specific questions, terminology, and approaches to solving problems. The exam is conducted as a single exam sitting. In the module description, the exam format for each course (written or oral, or written

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to be specified in writing and orally). For lectures, attendance is not mandatory; however, achieving the learning outcomes must still be ensured.

EX: Field trips are courses that take place outside the TU Wien premises. They are used to deepen course content within the relevant local context. 12

LU: Lab sessions are courses in which students, individually or in groups, solve experimental tasks under the guidance of supervisors_ to learn how to work with equipment and materials as well as the subject's experimental methods. Experimental facilities and workstations are provided.

PR: Projects are courses in which students deepen and broaden their understanding of specific areas of a discipline by working on concrete experimental, numerical, theoretical, or artistic tasks. Projects align with the program's qualification profile and supplement professional preparation and/or academic training.

SE: Seminars are courses in which students engage with an assigned topic or project and develop it using scholarly methods. This includes reflecting on the problem-solving process and participating in academic discussion.

UE: Exercises are courses in which students complete specific tasks—for example, calculations, design work, artistic work, or experiments. With subject-specific guidance or supervision, students build the skills and competencies needed to apply what they have learned to concrete assignments.

VU: Lectures with an integrated exercise component are courses that combine the two course types VO and UE into a single class. The exercise and lecture portions must each make up at least one quarter of the total course scope. In a VU course, the exercise component is always assessed continuously; the lecture component may be assessed either in a single exam sitting or continuously. It is therefore not permitted to assess the exercise component and the lecture component together in one single examination process.

Description of courses and examinations in the Study and Teaching Information System

- Course type (VO, EX, LU, PR, SE, UE, VU)
- Format (in-person, online, hybrid, blended)
- Dates (including, where applicable, the attendance required to successfully complete the course)

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- Content (overview of topics, prior knowledge)
- References 13
- Learning Outcomes (comprehensive description of learning outcomes)
- Methods (description of methods aligned with learning outcomes and assessment)
- Assessment (aligned with learning outcomes and methods)
  - Documentation of partial assessments, including an indication of which components may be retaken. This item does not apply to VO-type courses.
- Exams:
  - Content (description of content, references)
  - Format (in-person, online)
  - Exam type and/or mode
    - VO type: written, oral, or written and oral;
    - for all other types: documentation of partial assessments, including type and mode, with reference to the learning outcomes targeted in the course.
  - Dates
  - Grading criteria and grading standards

§ 7 Examination Regulations

Successfully completing the master's program requires:

1. successfully completing the modules specified in the curriculum, whereby a module is considered successfully completed when the courses assigned to it under the module description have been successfully completed,
2. preparing a thesis that receives a passing evaluation, and
3. successfully completing the final examination before a committee. This examination is conducted orally before an examination board in accordance with § 13 and § 19 of the *Study Law Provisions of the Statutes of TU Wien* and serves to present and defend the thesis and to demonstrate command of the relevant academic field. Particular emphasis is placed on understanding and broad overview knowledge. The registration requirements for the final committee examination pursuant to § 17 (1) of the *Study Law Provisions of the Statutes of TU Wien* are met once items 1 and 2 have been completed.

The final diploma includes

(a) the examination subjects, including their respective scope in ECTS credits and the grades awarded,

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(b) the topic and grade of the master's thesis,

(c) the grade for the board final examination, 14

(d) the overall assessment, as well as

(e) upon the student's request, the overall grade for the completed degree program in accordance with §72a UG.

The grade for the examination subject "Diploma Thesis" is the grade awarded for the diploma thesis. The grade for every other examination subject is calculated as the average of the grades from those courses that are assigned to the examination subject via the modules it includes, with each course grade weighted by the course's ECTS credits. If the decimal portion is less than or equal to 0.5, the result is rounded down; otherwise, it is rounded up. If none of the examination subjects is graded lower than "good" and at least half are graded "very good," the *overall assessment* is "passed with distinction"; otherwise, it is "passed."
Courses of the VO type (lecture) are assessed based on a final oral and/or written exam. All other course types have continuous assessment, meaning performance is evaluated throughout the term through ongoing checks of progress and, optionally, an additional final partial exam.

A passing result in exams and in academic as well as artistic work is graded as "very good" (1), "good" (2), "satisfactory" (3), or "sufficient" (4); a failing result is graded as "insufficient" (5). For courses where grading in the form stated above is not possible, assessment is recorded as "participated successfully" (E) or "participated unsuccessfully" (O).

§ 8 Feasibility of Study and Mobility

Students in the *Geodesy and Geoinformation* master's program should be able to complete their studies within the scheduled timeframe with a reasonable workload. Students are advised to follow the recommended semester plan in Appendix C. Students who begin their studies in the summer semester are advised to follow the semester plan recommended in Appendix D.
The assessment and attendance requirements for course types UE, LU, PR, VU, SE, and EX are defined as part of the course agreements with the academic authority responsible for study law and are published in the information system for studies and teaching. For rules on repeating partial requirements, reference is made to the study-law provisions of the university statutes.
Credit for coursework completed abroad is granted by the academic authority responsible for study law. To support mobility, the options listed in § 27 (1) to (3) of the *Study Law Provisions* of the statutes of TU Wien are available. In individual cases, these provisions may also be used to improve the feasibility of completing the program.

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The ECTS credits earned during a mobility period may be used to fulfill, to the appropriate extent, the Transferable Skills required in the module "Free Electives and Transferable Skills." In particular, they may also be credited to the topic pool of technology assessment, the development of technology, research ethics, gender mainstreaming, and diversity management.
If a course requires limiting the number of participants_and this could result in delays to the duration of studies, then, in accordance with UG § 58(8), the number of available places and the allocation procedure are specified in the curriculum under the respective module description.

§ 9 Master's Thesis

The master's thesis is an artistic-academic work that demonstrates the ability to address a topic independently in a substantively and methodologically sound manner. The thesis topic may be chosen freely by the student and must align with the qualification profile.
The examination subject *Master's Thesis* comprises 30 ECTS credits and consists of the academic thesis (master's thesis), worth 27 ECTS credits, as well as the final examination before a committee, worth 3 ECTS credits.
The master's thesis may be written in German or English. In particular, master's theses addressing topics in engineering consultancy may be written in German.

§ 10 Academic Degree

Graduates of the master's program *Geodesy and Geoinformation* are awarded the academic degree "Diplom-Ingenieur"/"Diplom-Ingenieurin" – abbreviated "Dipl.-Ing." or "DI" (internationally comparable to a "Master of Science").

§ 11 Quality Management

The quality management system for the master's program *Geodesy and Geoinformation* ensures that the program is coherently designed in line with TU Wien's study-related quality objectives, delivered efficiently and effectively, and reviewed on a regular basis. Quality management for the program follows the Plan-Do-Check-Act model, uses standardized processes, and is designed with specific target groups in mind. The target groups for quality management are, internally, students and instructors, and externally, society, industry, and public administration, including the job market for program graduates._

Given the defined target groups, six objectives are set for the quality of degree programs at TU Wien: (1) With regard to quality

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To ensure the curriculum remains current, the qualification profile is kept relevant to society and the labor market. With regard to the quality of how the curriculum is implemented in terms of content: (2) the learning outcomes in the curriculum modules are appropriately designed to deliver the qualification profile; (3) the learning activities and teaching methods are suitably selected to achieve those learning outcomes; and (4) the assessments are appropriate for verifying that the learning outcomes have been achieved. (5) With regard to the feasibility of completing the program, the necessary framework conditions are in place to ensure it. (6) With regard to teachability, the teaching staff have the subject-matter expertise and time resources needed to provide high-quality instruction.

To ensure the quality of the program, progress in planning, developing, and safeguarding each of the six quality objectives is collected separately and published. Quality assurance reviews whether the six quality objectives are being met. To measure the first and second quality objectives, the program committee reviews the qualification profile and module descriptions at least once per term of office. To review quality objectives two through five, ongoing student evaluations, as well as individual feedback on program operations submitted to the responsible academic body, continuously provide an overall picture of how the curriculum is being delivered. This ongoing review also serves to identify critical courses, for which suitable adjustments are developed and implemented in coordination between the responsible academic body, the program committee, and the course coordinators_. The sixth quality objective is addressed through quality-assurance instruments in the staffing area. In addition to internal quality assurance, an external evaluation of the program is conducted every seven years.

§ 12 Effective Date

This curriculum enters into force on October 1, 2025.

§ 13 Transitional Provisions

The transitional provisions can be found in Appendix B.

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A Module Descriptions

The courses assigned to each module are listed in the following format: 9.9/9.9 XX Course Title
Here, the first number indicates the course workload in ECTS credits, and the second indicates the number of semester hours. ECTS credits measure student workload: one academic year equals 60 ECTS credits, and one ECTS credit corresponds to 25 hours of 60 minutes each. One semester hour equals the number of class sessions corresponding to the number of teaching weeks in the semester. One class session lasts 45 minutes. The course type (XX) is explained in detail in § 6 under *Types of Courses* on page 11.

Parameter Estimation

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-Specific Competencies:

Technical and Methodological Competencies: After completing this module, students will be able to explain the fundamentals of parameter estimation using the least-squares method, statistics, and datum determination; discuss quality concepts; and apply these methods to geodetic problems. In addition, they will be able to reproduce the core principles of robust estimation methods, describe concepts such as auto-/cross-correlation, collocation, and regression, and explain the goals and methods of geostatistics.

Methodological Competencies: After completing the course, students will be able to identify and analyze parameter-estimation problems, independently set up and solve adjustment tasks, and independently perform statistical tests.

Content:

- Assessing the quality of measurements and results
- Addressing singular problems (geodetic datum)
- Robust estimation methods
- Parameter estimation in geometric and geodetic tasks
- Spatial statistics and time series

Expected Prior Knowledge:
Students can explain the mathematical foundations of geodesy and restate key statistical concepts (including the least-squares method).

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course before the semester begins; the same applies to the exam format and requirements.

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Module courses:
3.0/2.0 Lecture: Parameter Estimation
3.0/2.0 Exercise: Parameter Estimation

Seminars

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-specific competencies:

Disciplinary and methodological skills: After completing this module, students can demonstrate in-depth knowledge of an assigned seminar topic.
Cognitive and practical skills: After completing the course, students can locate specialized literature on a given topic, identify differences among methods or results reported in the literature, and synthesize multiple approaches or findings.

Interdisciplinary competencies:

Social and self-management skills: Students can plan their studies and present an individual master's study plan. Students can present a scientific paper, respond to critical questions and defend their reasoning, listen critically, engage in active discussion, and demonstrate an understanding of their discipline in a social context.

Content:

- Overview of the master's program and an individual master's study plan
- Topic selection
- Presentation
- When possible, guest lectures by external experts on technical, economic, legal, and socio-political topics
- Discussion

Expected prior knowledge:
Students can explain the mathematical foundations of geodesy.
Students can use presentation software.
Students show curiosity and a willingness to engage with non-discipline-specific but relevant topics.

Required prerequisites: To participate in the *Introductory Seminar* , active enrollment in the master's program in Geodesy and Geoinformation at TU Wien is required.

Teaching and learning methods used and appropriate assessment:

The teaching and learning methods used must be specified in the Studies and Teaching Information System for each course before the semester begins; the same applies to the examination format.

Module courses: From the courses *Seminar in Geodesy, Engineering Geodesy and Geophysics*, *Seminar in Photogrammetry and Remote Sensing*

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and *Seminar in Geoinformation and Cartography* only ONE seminar is required.

1.0/1.0 SE Introductory Seminar
2.0/1.0 SE Seminar in Geodesy, Engineering Geodesy, and Geophysics
2.0/1.0 SE Seminar in Photogrammetry and Remote Sensing
2.0/1.0 SE Seminar in Geoinformation and Cartography
3.0/2.0 SE Seminar in Geosciences

Free Electives and Transferable Skills

Standard workload: 9.0 ECTS

Learning outcomes: The courses in this module are designed to deepen subject-area expertise and build cross-disciplinary knowledge, skills, and competencies.

Content: Varies depending on the courses selected.

Expected prior knowledge: Varies depending on the courses selected.

Required prerequisites: Varies depending on the courses selected.

Teaching and learning methods used, and appropriate assessment methods:
The teaching and learning methods used must be listed in the Study and Teaching Information System for each course before the semester begins, along with the exam and assessment details.

Module courses: The courses in this module may be freely selected from the range of academic and arts-based courses offered by any recognized domestic or international postsecondary institution, provided they either deepen subject-specific knowledge or build interdisciplinary knowledge, skills, and competencies. The only restriction is that at least 4.5 ECTS must be chosen from the Transferable Skills areas; this also includes all courses in the module *Seminars*. For Transferable Skills, courses from TU Wien's central elective course catalog for "Transferable Skills" are especially recommended.

If, within other modules, courses are completed for a higher number of ECTS than required for that module, the number of ECTS to be completed in the module *Free Electives and Transferable Skills* is reduced by the same amount. However, across the master's program as a whole, a total of 4.5 ECTS in the Transferable Skills areas must still be completed.

Applied Geoinformation

Standard workload: 8.0 ECTS
Learning outcomes:

Subject-matter competencies:

Subject-specific and methodological competencies: After completing this module, students will be

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able to build complex geoinformation applications using cutting-edge methods, and to discuss and evaluate new approaches (e.g., spatial databases).
Cognitive and practical skills: After completing the courses, students will be able to analyze real-world applications, design solutions using appropriate technologies, and prepare reports and presentations.

Interdisciplinary competencies:

Social and self-management skills: Students can tackle practical problems and collaborate effectively in teams.

Content:

- Identifying the needs of potential users of spatial information
- Translating those needs into a technical solution
- Key features of GIS software
- Comparing commercial and open-source software
- Data sources: government/administration, open access, web use, and legal considerations
- WebGIS solutions: structure, components, and limitations
- Mobile and distributed applications—database and communication requirements
- "New" database structures (non-relational)
- Replication as a solution for distributed applications that aren't always connected
- Developing applications for autonomous mobile use

Expected prior knowledge:
Students have foundational knowledge of GIS.
Students have a basic understanding of WebGIS.

Required prerequisites: None.
Teaching/learning methods used and appropriate assessment:

The teaching and learning methods must be listed in the Studies and Teaching information system for each course before the semester begins; the exam format and assessment details must also be specified.

Courses in this module:
1.0/1.0 Lecture: Implementing a GIS
3.0/2.0 Lab/Exercise: Implementing a GIS
1.0/1.0 Lecture: Mobile GIS
3.0/2.0 Lab/Exercise: Mobile GIS

Applied Cartography

Standard workload: 7.5 ECTS
Learning outcomes:

Subject-matter competencies:

Subject-specific and methodological skills: The courses in this module are taught in English. Students become familiar with the principles of extending cartographic communication processes across different media. They understand the underlying concepts, constraints, and requirements.

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of location-based services. They can design, implement, and code components of cartographic information systems, particularly for LBS.

Content:

- Key concepts and building blocks of Location-Based Services (LBS)
- Indoor and outdoor positioning methods
- Data modeling for LBS
- LBS architecture
- Cartography for small-screen devices
- Use case: navigation and wayfinding
- Extending cartographic communication across different media
- Cross-media publishing
- Programming approaches and tools for cartographic applications

Expected prior knowledge:
Students are familiar with the fundamentals of topographic and thematic cartography as well as web publishing.

Required prerequisites: None.

Teaching and learning formats used, and appropriate assessment methods:

The teaching and learning formats must be listed in the Studies and Teaching Information System for each course before the semester begins; the exam format and requirements must be stated there as well.

Module courses:
4,5/3,0 VU Location-Based Services
3,0/2,0 VU Programming Cartographic Tasks

Climate and Environmental Remote Sensing

Standard workload: 6,0 -8,0 ECTS

Learning outcomes:

Subject-specific competencies:

Subject-related and methodological competencies: After completing the module, students know the key characteristics and processes of weather and the climate system. They understand the major global drivers of climate change across different time and space scales. Students can choose and apply suitable remote-sensing methods and datasets to monitor climate and environmental change. They also have a basic understanding of Earth system modeling and approaches to improve such models by integrating Earth observations.
Cognitive and practical competencies: After completion, students can interpret and untangle complex, nonlinear interactions within the Earth system and develop creative solutions based on Earth observations, Earth system modeling, and model-data

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Integration to measure and quantify change. Students can use Python to process and analyze global Earth observation datasets and to carry out basic Earth system modeling.

Interdisciplinary skills:
Social and self-management skills: Students can work independently as well as in teams to solve problems, implement processing workflows, produce reports, and communicate results.

Content:

- Fundamentals of meteorology and climatology
- Earth system dynamics across scales
- Earth observation and Earth system modeling—including associated uncertainties—for studying climate and environmental variability and change
- Theory and applications of stochastic and process-based Earth system modeling, with an emphasis on hydrological, land-surface, and climate models
- Model–data integration to improve Earth system modeling

Expected prior knowledge:
Students have strong Python programming skills and bring solid working knowledge of mathematics, physics, and computer science to the course. Familiarity with remote sensing theory is required. Experience with microwave remote sensing and pattern-recognition methods is a plus.
Students can develop creative solutions for processing tasks, data exploration, and analysis. They can present results to an audience and discuss them critically.

Students can work effectively in teams and manage tasks according to schedule.

Required prerequisites: None.
Teaching and learning methods and appropriate assessment:

The teaching and learning methods used must be listed in the Studies and Teaching Information System for each course before the semester begins; the exam format and requirements must be specified there as well.

Courses in this module: Select courses totaling at least 6.0 ECTS from the list below:
3.0/2.0 VU Climate and Environmental Remote Sensing
2.0/1.5 VO Introduction to Meteorology and Climatology
3.0/2.0 VU Model–Data Integration in Earth System Science

Earth Observation

Standard workload: 7.5 ECTS
Learning outcomes:

Subject-specific competencies:

Technical and methodological competencies: Students can choose and apply photogrammetry and remote sensing techniques to observe the Earth. They can work

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using multispectral imaging, LiDAR, and radar data to monitor environmental processes and urban areas.
Cognitive and practical skills: Based on the needs of the intended application, students will be able to choose the most suitable Earth observation technologies and processing methods. They gain hands-on expertise in processing airborne laser scanner data, multispectral imagery, and microwave measurements.

Interdisciplinary skills:
Social and self-management skills: Students can work effectively in teams to solve problems, implement processing workflows, and produce reports.

Content:

- Overview of Earth observation techniques and applications
- Use of imaging and laser scanning technologies for vegetation studies and urban modeling
- Parameter retrieval in Earth observation
- Monitoring dynamic hydrologic processes

Expected prior knowledge:
Students should bring a solid working knowledge of mathematics, physics, and computer science to the lectures. Familiarity with remote sensing theory, microwave remote sensing, and pattern-recognition methods is an advantage.
Students have basic computer skills.
Students can complete tasks on schedule, develop creative solutions for SAR processing tasks, explore and analyze data, and present their results.

Mandatory prerequisites: None.

Teaching/learning methods and appropriate assessment:
The teaching and learning methods used must be listed in the Studies and Teaching Information System for each course before the semester begins; the exam format must be specified as well.

Courses in this module:
1.5/1.0 VU Introduction to Earth Observation
3.0/2.0 VU Applied Earth Observation
3.0/2.0 VU Data Retrieval in Earth Observation

Space Geodesy

Standard workload: 9.0 ECTS
Learning outcomes:

Subject-specific competencies:

Technical and methodological skills: Students can describe space-geodetic techniques from both theoretical and practical perspectives, as well as their applications in astronomy, geodynamics, and weather forecasting. They understand the range of physical and geometric methods used in space geodesy.

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Cognitive and practical skills: Students can tackle space geodesy tasks as required in professional practice and research. They understand reference frames and how they are used for positioning and navigation.

Interdisciplinary skills:

Social and self-management skills: Students are proficient in planning, coordination, and project management.

Content:

- Theory and hands-on practice of modern space geodetic techniques (VLBI, Satellite and Lunar Laser Ranging, GNSS, DORIS, satellite altimetry, space gravity missions)
- Coverage of additional methods based on observations of extraterrestrial objects
- Global terrestrial and celestial reference frames
- Atmospheric effects on space-geodetic observations
- Assimilation of tropospheric delays in numerical weather models
- Executing all steps required for geodetic Very Long Baseline Interferometry

Expected prior knowledge: Basic knowledge of higher geodesy.

Mandatory prerequisites: None.

Teaching/learning methods used and appropriate assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course before the semester begins; the same applies to the examination format.

Module courses:

3.0/2.0 Lecture: Modern Space Geodetic Techniques
3.0/2.0 Integrated course: Very Long Baseline Interferometry
1.5/1.0 Lecture: Atmospheric Effects in Space Geodesy
1.5/1.0 Exercise: Atmospheric Effects in Space Geodesy

Advanced Engineering Geodesy

Standard workload: 9.0 ECTS

Learning outcomes:

Subject-specific competencies:

Technical and methodological skills: After completing this module, students will be able to describe and operate sensors, sensor systems, and data-processing methods used in advanced engineering geodesy within the scope of the course content, and to build interfaces between engineering geodesy and neighboring fields such as civil and mechanical engineering.
Cognitive and practical skills: After completing the module, students will be able to independently plan and carry out demanding metrology tasks in the field

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in engineering geodesy; design and deploy specialized engineering-geodetic sensor systems; and independently build expertise from advanced scientific literature. *Interdisciplinary competencies:*

Social and self-management skills: Students will be able to lead interdisciplinary teams in completing demanding metrology tasks.

Content:

- Static and dynamic sensor characteristics
- Principles, design, and performance of sensors and sensor systems for structural monitoring (strain gauges, inclinometers, pendulum measuring systems)
- Principles and measurement methods of geodetic gyroscopes
- Engineering geodesy for tunnel construction and monitoring
- Theory of deformation analysis and monitoring of structures and natural objects (deformation analysis models)
- Introduction to engineering mechanics
- Practical detection, localization, and modeling of deformations in a geodetic network
- Hands-on measurements using the sensors and sensor systems listed above

Expected prior knowledge: The following background can be obtained within a bachelor's program in Geodesy and Geoinformation, as well as in the module *Parameter Estimation*.

Students will be able to explain and apply parameter estimation and quality control in linear models of quasi-static networks. They are familiar with core concepts in statistics and engineering geodesy. They can operate the instruments and explain methods used in applied geodesy.
Students can use basic geodetic metrology equipment, write technical reports, and perform straightforward technical work in applied geodesy. Students can work effectively in a group.

Required prerequisites: None.

Teaching and learning methods, and appropriate assessment:

The teaching and learning methods used must be listed in the Study and Teaching Information System for each course before the semester begins; the exam format must also be specified.

Module courses:

4,5/3,0 Lecture Advanced Engineering Geodesy
1,5/1,0 Exercise Advanced Engineering Geodesy
3,0/2,0 Lab Measuring Exercise in Engineering Geodetic Metrology

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Real Property and Cadastre

Standard workload: 7.5 ECTS

Learning outcomes:

Subject-specific competencies:

Disciplinary and methodological competencies: After completing this module, students can understand and clearly explain property law—especially real estate law—rights in real property and how they are publicly recorded, legal transactions involving real property and how they are processed, as well as the technical aspects involved in handling such transactions.
Cognitive and practical competencies: After completing the courses, students are able to explain the relevant federal and state legal provisions for preparing subdivision plans in building land, including practical application examples.

Interdisciplinary competencies:

Social and self-management competencies: Students have mastered the fundamentals of team leadership in a civil engineering consulting office.

Content:

- General legal terminology; fundamentals of property law; real (in rem) rights; special forms of ownership; acquisition and loss of real rights; legal protection; restrictions on ownership; neighbor law; land register; changes in property holdings (subdivision, consolidation); subdivision restrictions; boundary cadaster; fundamentals of administrative procedure
- Historical development of the cadaster; responsibilities and competencies within Austria's cadaster system; the tasks and role of the BEV
- Cadaster procedures and processes with consideration of the land register; the control point network; development of the cadastral map; structure and management of the parcel database
- Land-use plan under the Vienna Building Code and the Lower Austria Spatial Planning Act: procedures; contents of a development plan
- Building code: contents; permitted use; building moratorium; amendments; publication of development regulations
- Subdivision plan under the Vienna and Lower Austria Building Codes: requirements; review; land dedication; building prohibitions; lapse of subdivision approval; boundary correction; expropriation; adjacent-owner obligations; compensation; permitted building capacity of building lots

Expected Prior Knowledge:
Students are familiar with the rules and procedures for preparing zoning plans, building codes, and subdivision plans. Students are able to create subdivision plans.

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Required prerequisites: None.

Teaching/learning methods used and appropriate assessment: The courses in this module are taught in German.

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course before the semester begins; the exam format must be specified there as well.

Module courses:

3.0/2.0 Lecture: Real Estate Law
1.5/1.0 Lecture: Advanced Cadastre
3.0/2.0 Exercise: Advanced Cadastre

Microwave Remote Sensing

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-specific competencies:

Disciplinary and methodological competencies: The students are able to describe the physical fundamentals of microwave remote sensing. They can explain and discuss the operating principles of active (altimeters, scatterometers, SAR) and passive microwave sensors, as well as the physical mechanisms behind microwave scattering and emission from the Earth's surface.
Cognitive and practical competencies: After completing the module, students can demonstrate a theoretical understanding of measurement principles and application areas, have hands-on experience processing SAR data, and can produce reports based on these data.

Interdisciplinary competencies:

Social and self-management competencies: Students can work in teams to solve complex SAR processing tasks.

Content:

- Electromagnetic waves
- Microwave sources and detection
- Microwave sensors
- Dielectric properties of natural media
- Physical mechanisms of scattering
- Physical mechanisms of emission
- SAR interferometry
- SAR processing, classification, and interpretation

Expected prior knowledge:

Students should bring a solid working knowledge of mathematics, physics, and computer science to the lectures. Familiarity with remote sensing theory is an advantage.

Students have basic computer skills.

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Students can complete tasks on schedule and develop creative approaches to SAR processing, data exploration, and analysis.

Required prerequisites: None.

Teaching and learning formats used, and appropriate assessment methods:

The teaching and learning formats used must be listed in the Study and Teaching Information System for each course before the start of the semester; the same applies to exam and assessment modalities.

Module courses:

3.0/2.0 Lecture: Microwave Remote Sensing
3.0/2.0 Exercise: Microwave Remote Sensing

Advanced Photogrammetry

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-specific competencies:

Technical and methodological competencies: Students can explain the mathematical and geometric foundations of photogrammetry and laser scanning in the context of observation models, parameter estimation, and georeferencing of hybrid observations. For imagery, they can also explain how image orientation, shape parameters, and point positions are computed, as well as the corresponding algorithms.

Cognitive and practical competencies: Students can extract geometric information from images and laser scanning data. They can describe, analyze, and evaluate quality measures of estimated parameters to assess data quality based on adjustment theory.

Interdisciplinary competencies:

Social and self-management skills: Work effectively in small teams.

Content:

- Collinearity equation and bundle block adjustment
- Methods of projective geometry
- Modeling observations
- Dealing with random, systematic, and gross errors
- Interpreting adjustment results in a photogrammetric context
- Methods for automating bundle block adjustment for unorganized photo sets
- Adjustment of laser scanning strips

Expected prior knowledge:

Students should have a working knowledge of linear algebra, parameter estimation, adjustment calculus, camera modeling, and methods for photo orientation.

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Students are able to run command-line programs and work with scripting languages. They have well-developed spatial skills.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be listed in the Study and Teaching Information System for each course before the semester begins; the exam format and procedures must be listed as well.

Courses in this module:

3.0/2.0 Lecture: Advanced Photogrammetry

3.0/2.0 Lab: Advanced Photogrammetry

Law and Economics

Standard workload: 5.0 ECTS

Learning outcomes:

Subject-specific competencies:

Technical and methodological competencies: After completing this module, students will be able to follow the rules required to run a business—especially a licensed civil engineering consulting office in Austria—and to describe and explain key aspects of construction and planning law.
Cognitive and practical skills: After completing the courses, students can analyze economic situations and address the kinds of issues that arise when running a civil engineering consultancy office, including evaluating and resolving the planning problems clients bring forward.

Interdisciplinary skills:

Social and self-management skills: Students have mastered the fundamentals of team leadership in a civil engineering consultancy office.

Content:

- Legal framework for civil engineering consultants in Austria: fields of practice, training requirements, and entry/registration requirements
- Business structures for professional practice: sole proprietorships and partnerships/corporate entities
- Overview of business administration: cameral accounting, rates, fees, charges, taxes, professional fees, office organization, key metrics for a consultant's office, and relevant parts of labor law
- Fundamentals of construction law and an overview of Austrian building and planning law: allocation of responsibilities, delineation of competences, permitting procedures, substantive building law, and legal remedies
- Basics of planning law: objectives and measures in regional and municipal spatial planning

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- Interplay Between Building and Planning Law Regulations

Expected Prior Knowledge:
Students have foundational knowledge of constitutional and administrative law, business administration, and cadastral systems. Familiarity with real property law is an advantage.

Required Prerequisites: None.

Teaching and Learning Methods Used and Appropriate Assessment: The courses in this module are taught in German.

The teaching and learning methods used must be specified in the Studies and Teaching Information System for each course before the semester begins; the same applies to exam formats and requirements.

Module Courses:

3.0/2.0 Practical Course: Managing a Licensed Engineering/Architecture Office

2.0/2.0 Lecture: Building and Planning Law

Gravity Field and Earth Rotation

Standard workload: 9.0 ECTS

Learning outcomes:

Subject-specific competencies:

Technical and methodological competencies: Students can describe observations and the mathematical representation of Earth's gravity field. They can explain how Earth's gravity field affects geodetic methods, and they have both theoretical and hands-on knowledge of Earth rotation and how it is determined.
Cognitive and practical skills: Students can work with real and simulated datasets to apply and deepen their knowledge of Earth's gravity field and rotation.

Transferable skills:
Social and self-management skills: Students can work through the lecture material and present their results.

Content:

- Theory of Earth rotation
- Changes in length of day, polar motion, and nutation
- Observing Earth rotation
- Tidal effects on Earth rotation and interactions within the Earth system
- Fundamentals of potential theory and the theory of Earth's gravity field
- Global and local geoid determination
- Gravity space missions

Expected Prior Knowledge:
Students have a basic background in physics (mechanics), mathematics, and higher geodesy

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Students have strong spatial reasoning skills.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be listed in the Study and Teaching Information System for each course before the semester begins; the same applies to the exam format.

Courses in this module:

3.0/2.0 Lecture The Gravity Field of the Earth
1.5/1.0 Exercise Global Gravity Field Models
3.0/2.0 Lecture Earth Rotation and Global Dynamic Processes
1.5/1.0 Exercise Earth Rotation and Global Dynamic Processes

Statistical Pattern Recognition

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-specific competencies:

Technical and methodological competencies: After completing this module, students can explain the theoretical foundations of statistics as well as the methods used to evaluate classification results. They can also summarize the most important approaches in statistical pattern recognition.
Cognitive and practical competencies: After completing the course, students can choose appropriate statistical pattern recognition methods for a given problem and implement classifications.

Content:

- Elementary classifiers
- Fundamentals of parameter estimation
- Bayes' Theorem
- Feature extraction

Expected prior knowledge:
Students are familiar with the basics of statistics (including the normal distribution and measures of a distribution) and linear algebra. Students can write code.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be listed in the Study and Teaching Information System for each course before the semester begins; the same applies to the exam format.

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Module courses:

3.0/2.0 Lecture: Statistical Pattern Recognition

3.0/2.0 Exercise: Statistical Pattern Recognition

Theoretical Cartography

Standard workload: 6.0–9.0 ECTS

Learning outcomes:

Subject-specific competencies:

Subject and methodological competencies: Students can describe the key theories and methods of scientific cartography. They understand cartographic modeling approaches in the areas of generalization, visualization, and interactivity. They can explain the principles of handling cartographic data in the context of interactive systems and interoperability.

Content:

- Current topics in cartographic research
- Cartographic modeling, including generalization
- GeoVisualization
- Cartographic data handling, including interoperability
- Maps as interfaces
- Maps as metaphors
- Methods and techniques for interactive work with cartographic data

Required prerequisites: None.

Teaching/learning methods used and appropriate assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course before the semester begins; the same applies to the exam format and conditions.

Module courses: Select courses totaling at least 6.0 ECTS from the list below:

3.0/2.0 Lecture: Theoretical Cartography

3.0/2.0 Integrated course: Cartographic Interfaces

3.0/2.0 Integrated course: Cartographic Information Systems

Geoinformation Theory

Standard workload: 8.0 ECTS

Learning outcomes:

Subject-specific competencies:

Subject and methodological competencies: After completing this module, students will be able to explain the theoretical foundations of geoinformation processing and mathematical-

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formal methods for spatial information computing. Students will gain an understanding of state-of-the-art techniques for efficient spatial data processing, access mechanisms, and core concepts in computational geometry.
Cognitive and practical skills: After completing the courses, students will be able to connect mathematical theory with application programming.

Content:

- Vector algebra for computing coordinates
- Projective geometry to determine line intersections and manage surface partitions
- Simplices and simplicial complexes to represent geometric shapes
- Relational algebra for data storage
- Functions for working with time-varying facts
- Spatial access mechanisms derived from general search-algorithm approaches
- Fundamentals of computational geometry
- Core methods: divide and conquer, incremental approaches, and plane sweep

Expected prior knowledge:
Students are able to implement geometric tasks in a command-line program.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be listed in the Studies and Teaching information system for each course before the semester begins; the exam format must be stated there as well.

Courses in this module:
4.0/3.0 VU Advanced GIS
4.0/3.0 VU Geometric Algorithms for GIS

Areal and Kinematic Measurement Methods in Engineering Geodesy

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-specific competencies:

Subject-specific and methodological competencies: After completing this module, students will be able to report on current research and developments in engineering geodesy. Cognitive and practical skills: Students will be able to plan and carry out an engineering geodesy research and development project, critically evaluate given requirements or framework conditions, prepare proposals for suitable adjustments, and present and discuss their own work as well as that of others.

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Interdisciplinary Competencies:
Social and self-management skills: Students can lead a research and development project, identify critical situations in an R&D project, and address them effectively. They are mindful of cost and quality and can also deliver projects under pressure.

Content:

- Fundamentals, design, and characteristics of sensors and sensor systems for industrial metrology and area-based geometry capture (laser tracking, terrestrial and close-range laser scanning)
- Advanced methods for processing areal data (estimation of standard geometries and free-form shapes)
- Design and implementation of state-estimation methods for trajectory estimation (Kalman filter)
- External control of geodetic sensors and sensor systems for use in kinematic applications
- Control of unmanned ground vehicles (UGV)
- Presentation and critical discussion of results

Expected Prior Knowledge:
Students have in-depth knowledge of the methods and sensors used in engineering geodesy.
Students can plan and carry out demanding technical tasks, independently build expertise using specialized literature, and write technical reports. They can solve problems using a scripting language.
Students can organize themselves in teams and carry out demanding technical tasks in engineering geodesy.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course before the semester begins; the same applies to the examination format.

Courses in this module:
3.0/2.0 VU Geometric Shape Determination in Engineering Geodesy
3.0/2.0 VU Selected Topics in Engineering Geodesy

Geo-Data and Data Processing

Standard workload: 6.0 – 9.0 ECTS

Learning outcomes:

Subject-matter competencies:

Technical and methodological competencies: Students can explain geo-data quality parameters and standards. They can also describe and apply methods for processing,

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Analyze and visualize geospatial data of different sizes, scopes, and complexity levels, including point cloud data
Cognitive and practical skills: Students gain a broad overview of common geospatial data standards and processing workflows. They can select appropriate software and methods to visualize datasets of varying size and complexity, along with their quality metrics. They can use statistical and point cloud processing tools to analyze large datasets. Students can evaluate data quality and determine whether the data is suitable for specific applications based on quality measures.

Content:

- Quality parameters
- Quality standards
- Point cloud description, feature extraction
- Point cloud segmentation and classification
- Graphical data visualization
- Regression

Expected prior knowledge:
Students are familiar with the fundamentals of statistics, linear algebra, and geospatial coordinate systems.
Students know how to work with geospatial data.

Required prerequisites: None.

Teaching and learning methods and appropriate assessment:

The teaching and learning methods used must be listed in the Studies and Teaching Information System for each course before the semester begins; the same applies to exam formats.

Module courses: Courses totaling at least 6.0 ECTS must be selected from the following list:

3,0/2,0 Lecture: Data Quality

3,0/2,0 Integrated Course: Point Cloud Processing

3,0/2,0 Integrated Course: Statistical Computing

Supplementary Mathematics

Standard workload: 5,5 – 8,5 ECTS

Learning outcomes:

Subject-specific competencies:

Subject-specific and methodological competencies: After completing this module, students can explain specialized and advanced mathematics and demonstrate in-depth knowledge. They can solve typical numerical problems, ranging from theoretical to practice-oriented tasks.

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Cognitive and practical skills: Students can apply alternative calculation methods. They understand the standard calculation approaches used in geodesy. They can manage small projects independently (partly using a computer).

Interdisciplinary skills:
Social and self-management skills: Students can propose alternative solutions.

Content:

- Graph theory and basic concepts in topology
- Introduction to numerical methods: error analysis—model errors, procedural errors, rounding errors; condition number (how sensitive a solution is to changes in the input data)
- Linear systems of equations, linear regression, nonlinear systems of equations
- Interpolation and best approximation
- Numerical integration—Newton–Cotes formulas, Gaussian quadrature
- Numerical methods for solving ordinary differential equations

Expected prior knowledge:
Students have a basic foundation in mathematics.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be listed in the Studies and Teaching Information System for each course before the semester begins; the same applies to the exam format and requirements.

Module courses:
3.0/2.0 VU Discrete Mathematics for Computer Science
5.5/4.0 VU Numerical Computation
The 5.5/4.0 VU *Numerical Computation* course is required.

Supplementary Specialization

Standard workload: 4.0–10.0 ECTS

Learning outcomes: Any course explicitly listed in this curriculum that is completed in addition will be recognized as a course.

Content: Depends on the selected courses.

Expected prior knowledge: Depends on the selected courses.

Required prerequisites: Depends on the selected courses.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be listed in the Studies and Teaching Information System for each course before the semester begins; the same applies to the exam format and requirements.

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Module courses: Any course explicitly listed in this curriculum is recognized as a module course if it was completed in addition to the degree requirements—meaning it was not otherwise applied toward the program. You do not need to submit entire modules. Courses completed during a study-abroad stay (e.g., through the ERASMUS program) may also be credited if there is no equivalent in the curriculum but they provide meaningful academic depth for the program. Choose courses totaling at least 4.0 ECTS, and no more than 10.0 ECTS.

Environment

Standard workload: 6.0–9.0 ECTS

Learning outcomes:

Subject-specific competencies:

Subject-Specific and Methodological Skills: After completing this module, students will be able to develop and explain an understanding of interdisciplinary environmental challenges—e.g., climate change, atmospheric processes, and the links between effective environmental protection and the legal system. They can also report on current developments at the international and European levels and their impacts in Austria.
Cognitive and Practical Skills: Students are able to connect discipline-specific knowledge and identify creative solutions to interdisciplinary issues at the intersection of technology, law, and real-world applications.

Interdisciplinary Skills:
Social and Self-Management Skills: Students can actively contribute to discussions and recognize the advantages and disadvantages of different problem-solving approaches.

Content:

- Earth observation and GIS for monitoring environmental change
- Global environmental issues, including climate and the greenhouse effect
- Structure and dynamics of Earth's atmosphere and key climate-relevant physical relationships
- Fundamentals and tools of environmental protection law
- Coverage of selected legal areas: general environmental law; climate protection under the Kyoto Protocol; trade and industry law; waste law; water law; forestry law; mining law; spatial planning law; building and construction law; nature conservation law; EU environmental law; and international environmental law.

Expected prior knowledge:
Students are expected to have basic knowledge of physics, geodesy, geoinfor-mation, and Earth observation.
Students are able to think in a problem-focused and structured way in order to address environmental topics.

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Students are interested in environmental topics.

Required prerequisites: None.

Teaching and learning methods used and appropriate assessment: Some courses in this module are taught in German. The teaching and learning methods must be specified for each course in the Studies and Teaching Information System before the semester begins; the same applies to the exam format.

Module courses: Select courses totaling at least 6.0 ECTS from the list below:

3.0/2.0 VU Global Change Monitoring
3.0/2.0 Lecture: Physics of the Atmosphere
3.0/2.0 Lecture: Environmental Protection Law

Environmental Geophysics

Standard workload: 6.5–9.5 ECTS

Learning outcomes:

Subject-specific competencies:

Disciplinary and methodological skills: After completing this module, students can design geophysical surveys and analyze geophysical signatures to investigate environmental processes.
Cognitive and practical skills: Students can understand the physical principles behind a range of geophysical methods and apply them to characterize environmental processes. The module includes computational and field-based exercises that build the skills needed to plan geophysical surveys and interpret the results.

Interdisciplinary skills:

Social and self-management skills: Students work in teams to develop solutions to a variety of environmental questions using geophysical methods. Through presentations, students learn how to communicate geophysical findings to audiences with diverse backgrounds as well as to fellow geoscientists.

Content:

- Understanding mechanistic models that explain geophysical signatures associated with hydrogeologic processes
- Collecting field measurements
- Processing and analyzing field and numerical data
- Modeling and inversion of geophysical imaging datasets
- Using petrophysical models for the quantitative interpretation of geophysical results
- Integrating geophysical results into environmental and engineering studies

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Expected Prior Knowledge:
Students should have a solid grasp of core concepts in physics and mathematics.
Experience writing Python scripts is helpful for successfully completing this module.
Students should be interested in exploring how physical properties connect to environmental processes.
Students are interested in environmental and Earth science topics.

Required Prerequisites: None.

Teaching and Learning Methods Used and Appropriate Assessment:

The teaching and learning formats used must be listed in the Study and Teaching Information System for each course before the semester begins; the exam format must be specified there as well.

Courses in the Module: Select courses totaling at least 6.5 ECTS from the following list:
3.0/2.0 VU Seismic Methods in Near-Surface Geophysics
2.0/2.0 UE Geophysical Data Processing
3.0/2.0 VO Exploration with Electric and Electromagnetic Methods
1.5/1.0 VO Biogeophysics and Environmental Geophysics

Navigation and Space

Standard Workload: 7.5 – 10.5 ECTS

Learning Outcomes:

Subject-Specific Competencies:

Subject-specific and methodological competencies: Students can describe methods and techniques for global and local navigation. They can evaluate and use products from GNSS services, including the European Union's Galileo system. Students understand the fundamentals of the solar system and its planets, as well as the basics of galaxies and cosmology.

Interdisciplinary Competencies:

Social and self-management skills: Students can analyze, evaluate, and explain current research.

Content:

- Space geodetic sites
- Inertial sensors and multi-sensor systems
- Overview of static point positioning using satellite techniques
- GNSS reference station networks and regional satellite navigation services
- Global GNSS services (IGS, EUREF)
- Basics of astronomy

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Expected prior knowledge:
Presentations and performance assessment, including oral exams and presentations. Visit to a space geodetic station.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods used must be listed in the Studies and Teaching Information System for each course before the semester begins; the same applies to the exam format and requirements.

Module courses: Select courses totaling at least 7.5 ECTS from the list below.

3.0/2.0 Lecture: Astronomy
3.0/2.0 Lecture: Navigation
3.0/2.0 Lecture: Satellite Navigation Systems and Services
1.5/1.0 Field Trip: Space Geodesy

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B Transitional Provisions

1. Unless stated otherwise, the term “program” below refers to the *Master’s Program in Geodesy and Geoinformation (degree program code UE 066 421)* . The term “new curriculum” means the curriculum for this program that is in effect at TU Wien as of 10/1/2025, and “old curriculum” means the curriculum that was in effect up to that date. Accordingly, “new” and “old” courses are those under the new or old curriculum, respectively (where “old” also includes earlier curricula). “Academic Affairs Body” refers to the Academic Affairs Body responsible for the Master’s Program in Geodesy and Geoinformation at TU Wien. 41

2. These transitional provisions apply to students who submit their graduation application at TU Wien under the new curriculum and who were admitted to the Master’s Program in Geodesy and Geoinformation at TU Wien before 7/1/2025. The extent to which these students make use of the transitional provisions is at their discretion.

3. Upon the student’s request, the academic affairs body may adjust these transitional provisions on an individual basis or extend them to students not covered by Section 2.

4. Certificates for courses that are equivalent in content may not be submitted at the same time toward the degree. In case of doubt, the academic affairs body determines whether the courses are equivalent.

5. Certificates for courses under the former curriculum may, unless otherwise specified below, be used toward the degree in any case, provided the student completed the course with the course semester Summer Semester 2025 or earlier.

6. Students who have completed the course “3.0/2.0 VO Introduction to Potential Theory” may continue to apply the module “Gravity Field and Earth Rotation” toward their degree, worth 12 ECTS credits.

7. Final examinations for courses are taken in the language of instruction of the respective course. Exceptions are permitted if agreed upon with the examiners in good time. In accordance with the study-law provisions of the Statutes of TU Wien, assessment is to be based on achievement of the learning outcomes, not on the level of language proficiency.

8. For students who were admitted to the Master’s program in Geodesy and Geoinformation at TU Wien before 7/1/2025, completion of the course *1.0/1.0 SE Introductory Seminar* is not mandatory. If the course is not completed, it may be possible for completion

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from the *Seminar* module, 1.0 ECTS may be credited toward any course listed in this curriculum.

9. Below, each course (*old* or *new*) is described by its scope in ECTS credits (first number) and semester hours (second number), as well as its type and title. The ECTS value that applies is the one for the course actually completed.

   The courses listed on the left side of the table below are the old courses. On the right side, you will find the course combinations for which the (combinations of) old courses may be used. (Combinations of) courses listed under the same item in the equivalency lists are considered equivalent.

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Old	New
1,5/1,0 VO Introduction to Earth Observation	1,5/1,0 VU Introduction to Earth Observation
1,5/1,0 UE Theory and Observation of Earth's Gravity Field	1,5/1,0 UE Global Gravity Field Models
4,5/3,0 VU Introduction to Numerical Methods	5,5/4,0 VU Numerical Computation
3,0/2,0 VO Seismic Exploration	3,0/2,0 VU Seismic Methods in Near-Surface Geophysics
3,0/2,0 VO Advanced Least-Squares Adjustment	3,0/2,0 VO Parameter Estimation
3,0/2,0 UE Advanced Least-Squares Adjustment	3,0/2,0 UE Parameter Estimation
2,0/1,0 SE Seminar in Geodesy, Engineering Geodesy, and Geophysics	2,0/1,0 SE Seminar in Geodesy, Engineering Geodesy and Geophysics
2,0/1,0 SE Seminar in Photogrammetry and Remote Sensing	2,0/1,0 SE Seminar in Photogrammetry and Remote Sensing
3,0/1,0 SE Seminar in Geoinformation and Cartography	3,0/1,0 SE Seminar in Geoinformation and Cartography
3,0/2,0 SE Seminar in Geosciences	3,0/2,0 SE Seminar in Geosciences
1,0/1,0 VO GIS Implementation	1,0/1,0 VO GIS Implementation
3,0/2,0 UE GIS Implementation	3,0/2,0 UE GIS Implementation
3,0/2,0 VO Modern Space Geodetic Methods	3,0/2,0 VO Modern Space Geodetic Techniques
4,5/3,0 VO Advanced Engineering Geodesy	4,5/3,0 VO Advanced Engineering Geodesy
1,5/1,0 UE Advanced Engineering Geodesy	1,5/1,0 UE Advanced Engineering Geodesy
3,0/2,0 PR Engineering Geodesy Measurement Practicum	3,0/2,0 LU Measuring Exercise on Engineering Geodetic Metrology
3,0/2,0 VO Advanced Photogrammetry	3,0/2,0 VO Advanced Photogrammetry
3,0/2,0 UE Advanced Photogrammetry	3,0/2,0 UE Advanced Photogrammetry
3,0/2,0 VO Theory and Observation of the Earth's Gravity Field	3,0/2,0 VO The Gravity Field of the Earth

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Old	New
1,5/1,0 UE Global Gravity Field Models	1,5/1,0 UE Global Gravity Field Models
3,0/2,0 VO Earth Rotation and Global Dynamic Processes	3,0/2,0 VO Earth Rotation and Global Dynamic Processes
1,5/1,0 UE Earth Rotation and Global Dynamic Processes	1,5/1,0 UE Earth Rotation and Global Dynamic Processes
3,0/2,0 VO Statistical Pattern Recognition	3,0/2,0 VO Statistical Pattern Recognition
3,0/2,0 UE Statistical Pattern Recognition	3,0/2,0 UE Statistical Pattern Recognition
4,0/3,0 VU Geometric Algorithms for GIS	4,0/3,0 VU Geometric Algorithms for GIS
3,0/2,0 VU Geometric Shape Determination in Engineering Geodesy	3,0/2,0 VU Determination of Geometric Shape in Engineering Geodesy
3,0/2,0 VU Selected Topics in Engineering Geodesy	3,0/2,0 VU Selected Topics of Engineering Geodesy
3,0/2,0 VO Data Quality	3,0/2,0 VO Data quality
3,0/2,0 VU Discrete Mathematics for Computer Science	3,0/2,0 VU Discrete Mathematics for Computer Science
3,0/2,0 VU Seismic Methods in Near-Surface Geophysics	3,0/2,0 VU Seismic Methods in Near-Surface Geophysics
2,0/2,0 UE Geophysical Data Processing	2.0/2.0 UE Geophysical Data Processing
3.0/2.0 VO Exploration Using Electrical and Electromagnetic Methods	3,0/2,0 VO Exploration with Electric and Electromagnetic Methods
1.5/1.0 VO Biogeophysics	1,5/1,0 VO Biogeophysics and Environmental Geophysics
3.0/2.0 VO Satellite Navigation Services	3,0/2,0 VO Satellite Navigation Systems and Services
1.5/1.0 EX Space Geodesy Field Trip	1,5/1,0 EX Excursion Space Geodesy
3.0/1.0 VO Managing a Licensed Engineering Consultancy	3.0/2.0 VU Managing a Licensed Engineering Consultancy _ Office

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C Semester-by-Semester Course Schedule

Some courses are listed in more than one of the first three semesters. Students should build a semester plan that works best for them based on the courses offered each term, and should also factor in courses not listed here that must be completed within the modules in the examination subject *Broadening in Subjects of Geodesy and Geoinformation* as well as the required module *Electives and Transferable Skills* .

Students are advised to choose courses in a way that keeps each semester's workload manageable.

1st Semester (Winter Semester) **30 ECTS**

1.0 SE Introductory Seminar

3.0 VO Parameter Estimation

3.0 UE Parameter Estimation

One of the following three seminars:

2.0 SE Seminar in Geodesy, Engineering Geodesy, and Geophysics

2.0 SE Seminar in Photogrammetry and Remote Sensing

2.0 SE Seminar in Geoinformation and Cartography

3.0 VU Managing a Licensed Engineering Office

3.0 VO Modern Space Geodetic Techniques

3.0 VU Very Long Baseline Interferometry

1.5 VO Atmospheric Effects in Space Geodesy

1.5 UE Atmospheric Effects in Space Geodesy

1.5 VU Introduction to Earth Observation

3.0 VO Microwave Remote Sensing

3.0 UE Microwave Remote Sensing

3.0 VO Statistical Pattern Recognition

3.0 UE Statistical Pattern Recognition

4.0 VU Advanced GIS

3.0 VU Discrete Mathematics for Computer Science

3.0 VU Point Cloud Processing

3.0 VO Data Quality

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3.0 VO Astronomy

3.0 VO Navigation 46

3.0 VO Exploration Using Electrical and Electromagnetic Methods

2.0 UE Geophysical Data Processing

3.0 VU Global Change Monitoring

3.0 VO Atmospheric Physics

2nd Semester (Summer Term) **30 ECTS**

One of the following three seminars:

2.0 SE Seminar in Geodesy, Engineering Geodesy, and Geophysics

2.0 SE Seminar in Photogrammetry and Remote Sensing

2.0 SE Seminar in Geoinformation and Cartography

3.0 SE Seminar in Geosciences

4.5 VO Advanced Engineering Geodesy

1.5 UE Advanced Engineering Geodesy

3.0 LU Measurement Lab: Engineering Geodetic Metrology

2.0 VO Building and Planning Law

3.0 VO Earth's Gravity Field

1.5 UE Global Gravity Field Models

3.0 VU Applied Earth Observation

3.0 VU Data Retrieval in Earth Observation

3.0 VO Advanced Photogrammetry

3.0 UE Advanced Photogrammetry

4.0 VU Geometric Algorithms for GIS

3.0 VO Theoretical Cartography

3.0 VU Cartographic Interfaces

3.0 VU Cartographic Information Systems

4.5 VU Location-Based Services

3.0 VU Programming Cartographic Workflows

5.5 VU Numerical Computation

3.0 VU Statistical Computing

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3.0 VU Geometric Shape Determination in Engineering Geodesy

3.0 VO Satellite Navigation Systems and Services

1.5 EX Field Trip: Space Geodesy 47

3.0 VU Seismic Methods in Near-Surface Geophysics

1.5 VO Biogeophysics and Environmental Geophysics

3.0 VO Legal Issues in Environmental Protection

3.0 VU Climate and Environmental Remote Sensing

2.0 VO Introduction to Meteorology and Climatology

3rd Semester (Winter Term) **30 ECTS**

3.0 SE Seminar in Geosciences

One of the following three seminars:

2.0 SE Seminar in Geodesy, Engineering Geodesy, and Geophysics

2.0 SE Seminar in Photogrammetry and Remote Sensing

2.0 SE Seminar in Geoinformation and Cartography

3.0 VU Managing a Licensed Engineering Consultancy

3.0 VO Earth Rotation and Global Dynamic Processes

1.5 UE Earth Rotation and Global Dynamic Processes

1.0 VO Implementing a GIS

3.0 UE Implementing a GIS

1.0 VO Mobile GIS

3.0 UE Mobile GIS

3.0 VO Real Property Law

1.5 VO Advanced Cadastral Studies

3.0 UE Advanced Cadastral Studies

3.0 VU Discrete Mathematics for Computer Science

3.0 VU Point Cloud Processing

3.0 VO Data Quality

3.0 VU Selected Topics in Engineering Geodesy

3.0 VO Astronomy

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3.0 Lecture: Navigation

3.0 Lecture & Lab: Global Change Monitoring 48

3.0 Lecture: Physics of the Atmosphere

3.0 Lecture & Lab: Model-Data Integration in Earth System Science

4. Semester (Summer) 30 ECTS

Thesis 27.0 ECTS Oral Final Examination (Committee) 3.0 ECTS

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Semester Recommendations for Students Starting Off-Cycle

Students who begin their program in the summer semester may face disadvantages in terms of how long their studies take. It is recommended that, at the start of your studies, you attend courses where no major comprehension difficulties are expected even if you are missing qualifications normally gained in earlier courses; for example, courses from the module *Electives and Transferable Skills* are recommended.

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E Recommendations for students pursuing a career as a_consulting engineer_in surveying in Austria

Under the Civil Engineers Act (1993, as of 1/2013), § 4(2)b, "consulting engineers for surveying" are authorized to prepare subdivision plans for cadastral and land-registry divisions of parcels and site plans for the land-registry write-off of entire parcels, to determine boundaries based on the current cadastral map or on the basis of documents, including boundary marking and the preparation of plans for the publication of building lines. This means that not only must the appropriate technical and professional training be in place, but the necessary legal foundations must also be mastered. Successfully passing the civil engineers' licensing exam is a prerequisite for a career as a consulting engineer_in. The required fields of knowledge are listed in the Civil Engineers Act, § 9(3) and (4).

Because the current curriculum gives students a great deal of flexibility in shaping their area of focus, the Austrian Federal Chamber of Civil Engineers has compiled recommendations for prospective consulting engineers_interested in surveying, so that they can begin preparing for the civil engineers' licensing exam during their studies. Students should therefore cover as many of the required areas as possible through elective modules and courses within the degree program and, if needed, through free electives. Below are a few suggested options:

Knowledge area for the civil engineers'_ licensing exam	Where it fits in the curriculum
Earth's gravity field	relevant course offerings within the elective module *Gravity Field and Earth Rotation*
Real Property and Cadastre	core foundations in the bachelor's program *Geodesy and Geoinformation* through the required module *Law and Science*, in this master's program via the elective module *Real Property and Cadastre*
Constitutional and Administrative Law	core foundations in the bachelor's program *Geodesy and Geoinformation* through the required module *Law and Science*
Construction and Planning Law	Elective Module *Law and Business*
Business Administration	Elective Module *Law and Business*

Completing the elective module Real Property and Cadastre is required in any case for admission to the civil engineering consultant_ examination.

Covered only in an encyclopedic way by this curriculum, but essential for obtaining the ci-

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civil engineering technician_licensure requires solid knowledge of real estate valuation, applied administrative law for technicians_, the basics of land registry law, spatial planning, fundamentals of road/rail/tunnel construction, the structure of Austrian building law, standards, and procurement. It is therefore recommended to complete as many suitable courses as possible within the module *Free Electives and Transferable Skills* from the offerings of TU Wien or other universities.

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F Examination Subjects with the Associated Required Modules and Courses

Examination Subject "In-depth Study of Fundamentals" (12.0 ECTS)

Module "Parameter Estimation" (6.0 ECTS)

3.0/2.0 VO Parameter Estimation
3.0/2.0 UE Parameter Estimation

Module "Seminars" (6.0 ECTS)

1.0/1.0 SE Introductory Seminar
2.0/1.0 SE Seminar in Geodesy, Engineering Geodesy, and Geophysics
2.0/1.0 SE Seminar in Photogrammetry and Remote Sensing
2.0/1.0 SE Seminar in Geoinformation and Cartography
3.0/2.0 SE Seminar in Geosciences

Examination Subject "Specialization in Geodesy and Geoinformation" (44.0–54.0 ECTS)

Module "Applied Geoinformation" (8.0 ECTS)

1.0/1.0 VO Implementation of a GIS
3.0/2.0 UE Implementation of a GIS
1.0/1.0 VO Mobile GIS
3.0/2.0 UE Mobile GIS

Module "Applied Cartography" (7.5 ECTS)

4.5/3.0 VU Location-Based Services
3.0/2.0 VU Programming Cartographic Tasks

Module "Earth Observation" (7.5 ECTS)

1.5/1.0 VU Introduction to Earth Observation
3.0/2.0 VU Applied Earth Observation
3.0/2.0 VU Data Retrieval in Earth Observation

Module "Climate and Environmental Remote Sensing" (6.0–8.0 ECTS)

3.0/2.0 VU Climate and Environmental Remote Sensing
2.0/1.5 VO Introduction to Meteorology and Climatology
3.0/2.0 VU Model–Data Integration in Earth System Science

Module "Space Geodesy" (9.0 ECTS)

3.0/2.0 VO Modern Space Geodetic Techniques
3.0/2.0 VU Very Long Baseline Interferometry
1.5/1.0 VO Atmospheric Effects in Space Geodesy

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1.5/1.0 EX Atmospheric Effects in Space Geodesy

Module "Advanced Engineering Geodesy" (9.0 ECTS)

4.5/3.0 LEC Advanced Engineering Geodesy
1.5/1.0 EX Advanced Engineering Geodesy
3.0/2.0 LAB Measurement Practicum in Engineering Geodetic Metrology

Module "Real Estate and Cadastre" (7.5 ECTS)

3.0/2.0 LEC Real Estate Law
1.5/1.0 LEC Advanced Cadastre
3.0/2.0 EX Advanced Cadastre

Module "Microwave Remote Sensing" (6.0 ECTS)

3.0/2.0 LEC Microwave Remote Sensing
3.0/2.0 EX Microwave Remote Sensing

Module "Advanced Photogrammetry" (6.0 ECTS)

3.0/2.0 LEC Advanced Photogrammetry
3.0/2.0 EX Advanced Photogrammetry

Module "Law and Economics" (5.0 ECTS)

3.0/2.0 LEC/EX Managing a Chartered Engineering Office
2.0/2.0 LEC Construction and Planning Law

Module "Gravity Field and Earth Rotation" (9.0 ECTS)

3.0/2.0 LEC Earth's Gravity Field
1.5/1.0 EX Global Gravity Field Models
3.0/2.0 LEC Earth Rotation and Global Dynamic Processes
1.5/1.0 EX Earth Rotation and Global Dynamic Processes

Module "Statistical Pattern Recognition" (6.0 ECTS)

3.0/2.0 LEC Statistical Pattern Recognition
3.0/2.0 EX Statistical Pattern Recognition

Module "Theoretical Cartography" (6.0–9.0 ECTS)

3.0/2.0 LEC Theoretical Cartography
3.0/2.0 LEC/EX Cartographic Interfaces
3.0/2.0 LEC/EX Cartographic Information Systems

Module "Geoinformation Theory" (8.0 ECTS)

4.0/3.0 LEC/EX Advanced GIS
4.0/3.0 LEC/EX Geometric Algorithms for GIS

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Exam Subject "Broadening in Geodesy and Geoinformation" (15.0–25.0 ECTS)

Module "Areal and Kinematic Measurement Methods in Engineering Geodesy" (6.0 ECTS)

3.0/2.0 VU Geometric Shape Determination in Engineering Geodesy
3.0/2.0 VU Selected Topics in Engineering Geodesy

Module "Geo-Data and Data Processing" (6.0–9.0 ECTS)

3.0/2.0 VO Data Quality
3.0/2.0 VU Point Cloud Processing
3.0/2.0 VU Statistical Computing

Module "Supplementary Mathematics" (5.5–8.5 ECTS)

3.0/2.0 VU Discrete Mathematics for Computer Science
5.5/4.0 VU Numerical Computation

Module "Supplementary Specialization" (4.0–10.0 ECTS)

Module "Environment" (6.0–9.0 ECTS)

3.0/2.0 VU Global Change Monitoring
3.0/2.0 VO Atmospheric Physics
3.0/2.0 VO Legal Issues in Environmental Protection

Module "Environmental Geophysics" (6.5–9.5 ECTS)

3.0/2.0 VU Seismic Methods in Near-Surface Geophysics
2.0/2.0 UE Geophysical Data Processing
3.0/2.0 VO Exploration Using Electric and Electromagnetic Methods
1.5/1.0 VO Biogeophysics and Environmental Geophysics

Module "Navigation and Space" (7.5–10.5 ECTS)

3.0/2.0 VO Astronomy
3.0/2.0 VO Navigation
3.0/2.0 VO Satellite Navigation Systems and Services
1.5/1.0 EX Field Trip: Space Geodesy

Exam Subject "Electives and Transferable Skills" (9.0 ECTS)

Module "Electives and Transferable Skills" (9.0 ECTS)

Exam Subject "Diploma Thesis" (30.0 ECTS)

27.0 ECTS Diploma Thesis
3.0 ECTS Final Oral Board Examination

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