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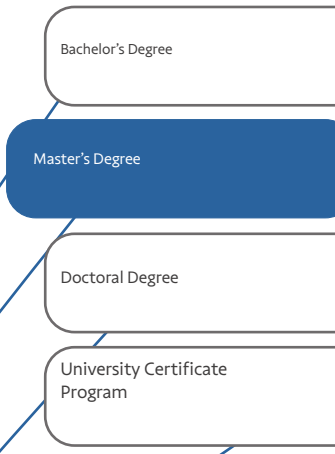

Curriculum for the

Master's Degree Program
Geodesy and Geoinformation
UE 066 421

Vienna University of Technology
Resolution of the Senate of TU Wien
on May 11, 2026

Effective as of October 1, 2026

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§ 1 Basis and Scope of Application

This curriculum sets forth and governs the engineering-focused, English-language master's degree program *Geodesy and Geoinformation* at TU Wien (Vienna University of Technology). It is based on the Austrian Universities Act 2002 (UG) (Federal Law Gazette I No. 120/2002, as amended) and the "Study Law Provisions" of the TU Wien Statutes, as amended from time to time. The structure and design of the program are aligned with the following qualification profile (§ 2).

§ 2 Qualification Profile

The master's degree program *Geodesy and Geoinformation* provides an advanced education of high scientific and methodological quality, designed to ensure lasting knowledge. It enables graduates to pursue further qualifications—particularly through a relevant doctoral program—as well as to enter employment in, for example, the following fields of activity, thereby supporting international competitiveness:

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

In light of growing challenges in resource management, the development of urban and natural environments, environmental protection, and climate change, modern society requires reliable information on the underlying processes and their interactions. For this reason, the ability to capture, model, link, and communicate spatial data to society plays a key role. The program is internationally oriented and is designed with equal attention to the tasks at hand, the student body, and the labor market.
In response to professional requirements, the master's program *Geodesy and Geo-information* provides qualifications in the following categories.

Subject-Matter Competencies

- Advanced knowledge of adjustment computation
- Advanced knowledge of methods and sensors used in engineering geodesy
- Knowledge of construction law, as well as foundational knowledge of land registry law and surveying legislation

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- Theory of the Gravitational Field
- Theory and Practice of Geodetic Space Methods and Atmospheric Influences 4

- Theory of Earth's Rotation and Geodynamic Processes
- Advanced Expertise in Photogrammetry and Remote Sensing
- Analysis and Integration of Spatially Referenced Information
- Advanced Expertise in Cartography
- Ability to Independently Plan and Execute Complex Technical Tasks in Surveying and Geoinformation

Interdisciplinary Competencies

- Critical engagement with current professional literature, particularly English-language publications
- Presentation and discussion of one's own work and the work of others
- Project execution and effective performance under time pressure
- Preparation of scholarly papers
- Leadership of teams in carrying out complex technical tasks
- Critical evaluation of specified requirements and/or framework conditions and development of proposals for appropriate adjustments (consulting)
- Graduates are able to work effectively in multicultural teams and, through instruction delivered in English, possess the relevant technical vocabulary in English
- Ability to address and reconcile conflicting information
- Cost and quality awareness

§ 3 Duration and Scope

The master's program *Geodesy and Geoinformation* requires a total workload of 120 ECTS credits. This corresponds to a standard full-time program duration of four semesters.
ECTS credits (ECTS) measure students' workload. One academic year comprises 60 ECTS credits, with one ECTS credit equaling 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 program or another relevant program at least at the same level of higher-education qualification, completed at a recognized domestic or international postsecondary institution. Relevant programs include foundational scientific disciplines such as mathematics and physics or computer science. In any case, relevant is

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the bachelor's degree program in *Geodesy and Geoinformation* at TU Wien and the bachelor's degree program in *Geodesy* at TU Graz.
To address substantial differences in subject-matter preparation, additional examinations totaling up to a maximum of 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 evidence of the required language proficiency. The accepted form of proof is specified in a Rectorate regulation.
English proficiency is deemed demonstrated if the requirements set out in the Rectorate regulation on the language skills and documentation required for admission to degree programs are met, or if relevant English-taught courses were completed during the bachelor's program. No German-language proficiency is required to complete this program. However, for students who intend to pursue a career as an_ engineering consultant_ in surveying, German proficiency is recommended, as relevant elective courses (see Appendix F) are offered only in German.

§ 5 Structure of the Program

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, instructional and learning formats, the standard workload, and the assessment of performance. Modules are completed through one or more thematically connected *courses*. Modules with related subject matter are grouped into *examination subjects*, whose title, scope, and overall grade are listed on the final certificate.

Examination Subjects and Associated Modules

The master's program *Geodesy and Geoinformation* is structured into the examination subjects listed below, together with the modules assigned to them.

In-Depth Study of Fundamentals (12.0 ECTS)

Parameter Estimation (6.0 ECTS)
Seminars (6.0 ECTS)

Specialization in Geodesy and Geoinformation (44–54 ECTS)

Within the examination subject *Specialization in Geodesy and Geoinformation* , courses from the following modules must be completed for a total of at least 44 ECTS and no more than 54 ECTS:

Applied Geoinformation (8.0 ECTS)

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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)
Land 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)
Advanced Geoinformation (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 totaling at least 15 ECTS and no more than 25 ECTS, such that, together with the examination subject *Specialization in Geodesy and Geoinformation* , a minimum of 69 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 (6.0–8.0 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, courses from other modules may also be completed, provided that they are not used to fulfill the requirements of those modules. With the approval of the responsible academic authority, courses for which no equivalencies exist, but which provide an in-depth academic extension of the program, may additionally be completed during a study-abroad period (e.g., within the ERASMUS Program).

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Free Electives and Transferable Skills (9.0 ECTS)

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The courses for the Free Electives and Transferable Skills module may be selected freely from the offerings of all recognized domestic and international universities; however, at least 4.5 ECTS must be completed in the area of Transferable Skills. This requirement also includes all courses in the module *Seminars*. If courses from other modules are completed for a higher ECTS workload than required for those modules, the number of ECTS to be completed in the module *Free Electives and Transferable Skills* shall be reduced by the same amount; however, a total of 4.5 ECTS in the subject areas of Transferable Skills must in any case be completed within the master's program.

Master's Thesis (30.0 ECTS)

Please refer to Section § 9.

Brief Description of the Modules

This section provides a concise overview of the modules in the master's program *Geodesy and Geoinfor-mation* . A detailed description is available in Appendix A.

Parameter Estimation (6.0 ECTS) The Parameter Estimation module begins with the standard least-squares method and examines key challenges associated with its use. Primary topics include quality assessment, the detection of gross errors through robust estimation, and a range of applications relevant to geodesy and geoinformation. In addition, statistical ana-lysis is broadened from the treatment of individual values to spatially distributed phenomena.

Seminars (6.0 ECTS) The introductory seminar in this module supports students in developing an individualized master's study plan. In the additional seminars included in this module, students build skills in reviewing existing literature on a focused topic and presenting a clear overview of their findings to an audience. Further emphasis is placed on active, critical listening and thoughtful engagement with scientific presentations.

Elective Courses and Transferable Skills (9.0 ECTS) The courses in this module are intended to deepen disciplinary expertise while also developing cross-disciplinary knowledge, abilities, and competencies, including transferable skills. Courses may be selected from the offerings of any recognized domestic or international postsecondary educational institution.

Applied Geoinformation (8.0 ECTS) This module concentrates on developing advanced geoinformation applications using current, AI-enabled, and web-based methods. It includes the design and evaluation of human-subject experiments in mobile GIS settings, the integration of AI components into (Web)GIS, and core principles of Application Programming Interfaces (APIs) for geospatial systems.

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Applied Cartography (7,5 ECTS) The Applied Cartography module addresses the practical application of cartographic methods to produce maps and cartographic visualizations in formats appropriate to the intended media. Particular emphasis is placed on integrating competencies in data management, the effective use of diverse media, and cartographic design expertise.

Climate and Environmental Remote Sensing (6,0 -8,0 ECTS) This module offers an overview of the mechanisms and driving factors behind Earth system variability and change across time and space. It focuses specifically on how Earth observation may be used to quantify these dynamics, develop statistical forecasting models, and enhance existing process-based models through model–data integration.

Earth Observation (7,5 ECTS) The Earth Observation module addresses the use of sensors deployed 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 techniques to derive geophysical variables from measurements across the optical, infrared, and microwave spectra.

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

Advanced Engineering Geodesy (9,0 ECTS) This module covers common sensor systems, measurement procedures, and methods used in engineering geodetic monitoring. In addition to the theoretical foundations, practical exercises demonstrate the operation of the sensor systems and the use of specialized software.

Liegenschaft und Kataster (7,5 ECTS) This module provides an introduction to legal subject areas relevant to surveying, with a primary focus on the Austrian legal framework. Topics include general legal concepts, the cadastre, the land register, the parcel database, zoning and development plans, and subdivision plans.

Microwave Remote Sensing (6,0 ECTS) This module addresses active and passive microwave remote sensing techniques and their applications. Beginning with fundamental physical principles, it examines key measurement concepts and how microwave signals interact with natural components, including soil, vegetation, water, and ice.

Advanced Photogrammetry (6,0 ECTS) The Advanced Photogrammetry module aims to develop a thorough understanding of observations and parameter estimation in photogrammetry, with the use of cameras and laser scanners. Building on this foundation, solutions to complex photogrammetric tasks are presented and analyzed. The acquired knowledge is reinforced and applied through exercises.

Recht und Wirtschaft (5,0 ECTS) This module covers fundamental business administration and legal principles relevant to the management of a civil engineering consultancy office, as well as the basics of Austrian construction and planning law.

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Gravity Field and Earth Rotation (9,0 ECTS) The gravity field is not perfectly spherically symmetric, and the Earth does not complete its axial rotation in exactly 24 hours. This module addresses the theory and observation of the gravity field, Earth's rotation, and the interactions between these quantities. Global dynamic processes are essential to both topics.

Statistical Pattern Recognition (6,0 ECTS) This module pursues three objectives: I) Review and reinforce the fundamentals of statistics and probability theory from both frequentist and Bayesian perspectives, including distributions, estimation theory, and statistical tests. II) Introduce core principles of decision theory and classification. III) Examine selected applications of these areas, ranging from dimensionality reduction using PCA to addressing confounding through regression.

Theoretical Cartography (6,0 – 9,0 ECTS) This module examines the principal paradigms of scientific cartography, contemporary schools of thought, the resulting body of knowledge, and current research agendas. Particular emphasis is placed on applying theoretical foundations to research-oriented work.

Advanced Geoinformation (8,0 ECTS) This module offers a theoretical foundation for geoinformation systems, with an emphasis on computational geometry and geometric modeling. It introduces key concepts in Geospatial Artificial Intelligence (GeoAI) and presents principles of GIS-based problem solving for selected advanced geospatial topics.

Areal and Kinematic Measurement Methods in Engineering Geodesy (6,0 ECTS) This module presents fundamental and advanced concepts in areal and kinematic measurement and analysis, using a research-oriented approach. Practical demonstrations and selected in-house developments are employed to illustrate the material and to support the application of theory in practice.

Geo-Data and Data Processing (6,0 – 9,0 ECTS) Effective use of (geo-)data requires a clear understanding of the task, the available data, and the ability to define and evaluate data quality. The courses in this module address data-quality concepts, statistical computing, and the processing and visualization of data using multiple forms of geodata, including point clouds and vector data.

Supplementary Mathematics (6,0 – 8,0 ECTS) This module provides an introduction to discrete mathematics and numerical computation.

Supplementary Specialization (4,0 – 10,0 ECTS) This supplementary specialization extends beyond the content covered in the other selected specialization modules. Any course explicitly listed in this curriculum that has been completed without completing the module in which it is included is recognized as an individual 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 fields pertinent to environmental protection.

Environmental Geophysics (6,5 – 9,5 ECTS) Many of the processes that sustain life as it is currently understood occur within the soil, from plant growth to the storage

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of organic carbon and water. Environmental Geophysics offers a range of methods that enable the study of subsurface processes without disturbing them. This module reviews these geophysical methods and the relevant physical properties, with particular emphasis on understanding biogeochemical processes.

Navigation and Space (7.5–10.5 ECTS) Navigation is an essential part of daily life. This module presents various techniques for positioning and navigation, with an emphasis on satellite-based methods such as Global Navigation Satellite Systems (GNSS). The module also includes an introduction to astronomy and an excursion to a space geodetic observatory.

§ 6 Courses

The subject areas covered in the modules are delivered 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 (UG). The types of course assessments are set out in the Examination Regulations (§ 7).
With regard to the options available to the Curriculum Committee to extend modules by adding courses for one semester, and to the body responsible for academic regulations to assign courses to elective modules on an individual basis for specific students, reference is made to § 27 of the academic-regulations 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 directory must be published (title, name of the course director, type, format including location, and course dates). This directory must be kept up to date on an ongoing basis.
In addition to the published directory, course directors must, prior to 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, assessment criteria, and grading standards of the examinations.
For examinations conducted as a single examination process, examination dates must be scheduled at least three times each semester (as stipulated in the statutes: at the beginning, mid-semester, and at the end). Students must be informed, prior to the start of each semester, about the content, format, methods, dates, assessment criteria, and grading standards of the examinations.
For examinations conducted using electronic communication tools, the proper administration of the examination must be ensured. In addition to the general examination regulations, the following minimum requirements must be met:

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- Prior to the start of the semester, the standards that students' technical devices must meet shall be announced so that students may participate in these examinations.
- To ensure that the examination is completed independently by the student, appropriate technical or organizational measures shall be provided. 11

- In the event of technical issues that occur through no fault of the student, the examination must be discontinued and must not be counted toward the permitted number of examination attempts.

Requirements for Courses as Set Forth in the Statutes of TU Wien

In the following, SSB refers to the *Statutes of TU Wien, Study Law Provisions*.

- The scope of the course must be stated in ECTS credits and in semester hours. See § 9(2) SSB (Modules and Courses).
- Offering a course as an "intensive block course" is permitted upon approval by the academic affairs body responsible for study law matters. See § 9(3) SSB (Modules and Courses).
- To offer and examine a course in a foreign language, the consent of the academic affairs body responsible for study law matters is required. See § 11(1) SSB (Foreign Languages).
- Course examinations serve to verify the learning outcomes conveyed by an individual course. See § 12(1) SSB (Course Examination).
- Course examinations are to be administered by the_course instructor_. Where necessary, the academic affairs body responsible for study law matters shall appoint another_ suitably qualified examiner_. See § 12(2) SSB (Course Examination).
- In any event, for examinations in required and required-elective courses that conclude with a single examination sitting, three examination dates must be scheduled for the beginning, the middle, and the end of each semester. These must be announced with dates prior to the start of the semester. See § 15(1) SSB (Examination Dates).
- Examinations may also be held at the beginning and at the end of periods without scheduled classes. See § 15(1) SSB (Examination Dates).
- The examination dates must be announced in an appropriate manner. See § 15(1) SSB (Examination Dates).

Description of Course Types

VO: Lectures are courses in which the content and methods of a discipline are presented, with particular attention to its specific questions, conceptual frameworks, and approaches to solutions. The examination is conducted in a single examination sitting. In the module description, the

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The examination format for each course (written or oral, or both written and oral) must be specified. For lectures, attendance is not mandatory; however, achievement of the learning outcomes must nevertheless be ensured.

EX: Field trips are courses conducted outside the premises of TU Wien. They are intended to deepen course content within the relevant local context. 12

LU: Laboratory exercises are courses in which students, individually or in groups, complete experimental tasks under the guidance of supervisors_ in order to learn the proper handling of equipment and materials, as well as the discipline's experimental methodology. The experimental facilities and workstations are provided.

PR: Projects are course components in which understanding of specific subfields is deepened and expanded through the completion of concrete experimental, numerical, theoretical, or artistic tasks. Projects are aligned with the program's qualification profile and complement professional preparation and/or academic training.

SE: Seminars are course components in which students engage with an assigned topic or project and develop it using scholarly methods; reflection on the problem-solving process as well as academic discourse are required.

UE: Exercises are course components in which specific tasks—such as computational, design-oriented, artistic, or experimental work—are to be completed. Under subject-matter guidance or supervision, students' skills and competencies are developed for application to concrete tasks.

VU: Lectures with an integrated exercise component are course formats in which the two course types, VO and UE, are combined within a single course. The respective exercise and lecture portions must each account for no less than one quarter of the total scope of the course. In the VU course type, the exercise component is always assessed on an ongoing basis; the lecture component may be assessed either through a single examination or on an ongoing basis. It is therefore not permitted to assess the exercise component and the lecture component together within one single examination process.

Description of courses and examinations in the information system for studies and teaching

- Type of course (VO, EX, LU, PR, SE, UE, VU)
- Format (in person, online, hybrid, blended)

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- Dates (including, where applicable, the attendance required for successful completion)
- Content (description of content, prior knowledge) 13
- Bibliography, References
- Learning Outcomes (comprehensive description of the learning outcomes)
- Methods (description of methods aligned with learning outcomes and assessment requirements)
- Assessment Requirements (aligned with learning outcomes and methods)
  - Documentation of partial assessments, including an indication of which partial assessments may be repeated. This item does not apply to the VO type.
- Examinations:
  - Content (description of content, references)
  - Format (in-person, online)
  - Examination 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
  - Assessment criteria and grading standards

§ 7 Examination Regulations

Successful completion of the master's program requires:

1. the successful completion of the modules required under the curriculum, whereby a module is deemed successfully completed when the courses attributable to it under the module description have been successfully completed.

2. the preparation of a thesis that has received a passing evaluation, and

3. the successful completion of the final examination before a committee. This examination is conducted orally before an examination committee 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 shall be placed on comprehension and broad, overview knowledge. The registration requirements for the final examination before a committee pursuant to § 17 (1) of the *Study Law Provisions of the Statutes of TU Wien* are met once items 1 and 2 have been fulfilled. The examination committee for the final examination before a committee consists of the chair and three committee members. The Dean of Studies serves as chair but may also delegate this duty. The committee members must represent different subject areas and assess competencies and the content of a course within the master's program (lecture [VO] or lecture with integrated exercises [VU]). They

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must be substantially involved in the respective course or hold the appropriate authorization to teach. Only one member of the committee may be drawn from the group of external lecturers. The examination committee and the courses to be examined must be approved by the_Vice Dean for Academic Affairs_. The committee final examination lasts approximately 60 minutes and is divided into two parts: a 20-minute presentation of the diploma thesis followed by an open discussion, and a sequential examination in the selected subjects conducted by the examination committee. The grade for the committee final examination is determined jointly by the examination committee and is based on a cumulative assessment of performance in the presentation and the partial examinations.

The final certificate includes

(a) the examination subjects, including their respective scope in ECTS credits and their grades,
(b) the title and grade of the diploma thesis,
(c) the grade of the committee final examination,
(d) the overall assessment, as well as
(e) upon request of the_student, the overall grade for the completed degree program in accordance with §72a of the Universities Act (UG).

The grade for the examination subject "Diploma Thesis" is derived from the grade awarded for the diploma thesis. The grade for each other examination subject is determined by calculating the average of the grades from those courses that are attributable to the respective subject via the modules it comprises, with each course grade weighted according to the course's ECTS credit value. If the decimal portion is less than or equal to 0.5, the result is rounded down; otherwise, it is rounded up. If no examination subject is graded lower than "good" and at least half are graded "very good," the *overall assessment* shall be "passed with distinction"; otherwise, it shall be "passed."

Courses "passed."

VO (lecture) type are assessed on the basis of a final oral and/or written examination. All other courses have an ongoing assessment character; that is, evaluation is conducted continuously through accompanying performance checks and, where applicable, an additional final partial examination.

Successful completion of examinations and of scholarly as well as artistic work shall be assessed as "very good" (1), "good" (2), "satisfactory" (3), or "sufficient" (4); unsuccessful completion shall be assessed as "insufficient" (5). For courses in which assessment in the above form is not possible, evaluation shall be recorded as "participated successfully" (E) or "participated unsuccessfully" (O).

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§ 8 Program Feasibility and Mobility

Students in the master's program *Geodesy and Geoinformation* should be able to complete their studies within the prescribed timeframe with a reasonable workload. Students are advised to complete their studies in accordance with the recommended semester plan in Appendix C. Students who begin their studies in the summer semester are advised to follow the modified recommended semester plan in Appendix D.
The assessment and attendance requirements for courses of the types UE, LU, PR, VU, SE, and EX shall be defined within the scope of the teaching agreements with the academic body responsible for study matters and published in the Information System for Studies and Teaching. In addition, the provisions of the Statutes (study-law provisions on the repeatability of partial assessments) shall be observed. Any course with an enrollment cap, where a student's inability to participate as intended could potentially delay completion of the program, must be identified in the curriculum in accordance with the UG, including the number of available seats and the allocation procedure. The affected courses, the number of seats, and the method of allocation shall be determined by the curriculum committee and presented clearly and understandably for students in the module descriptions.

Courses subject to resource-based participation limits are to be appropriately identified in the Study and Teaching Information System. In addition, the number of available seats and the procedure for allocating those seats must be specified.

Credit for academic work completed abroad is granted by the competent academic affairs authority. To facilitate mobility, the options set out in Section 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 applied to improve the feasibility of completing the program of study.
ECTS credits earned during a mobility period may be used to fulfill, to the appropriate extent, the transferable skills requirement in the module "Electives and Transferable Skills." In particular, they may also be credited toward the topic pool of technology assessment, the development of technology, research ethics, gender mainstreaming, and diversity management.

When assessing material differences in the competencies acquired in courses/modules completed as part of a mobility program, it is recommended that subject-specific competencies be used as the primary basis.

§ 9 Master's Thesis

The master's thesis is an artistic-scholarly work intended to demonstrate the ability to address an academic topic independently, both in terms of content and methodology

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can be addressed within a reasonable scope. The topic of the thesis may be selected freely by the student and must be consistent with the qualification profile.
The examination component *Thesis* comprises 30 ECTS credits and consists of the academic paper (thesis), which is awarded 27 ECTS credits, as well as the final oral examination before a committee, amounting to 3 ECTS credits.
The thesis may be written in German or English. In particular, theses addressing topics related to the profession of consulting engineer 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 consistently designed in line with TU Wien's program-related quality objectives, is administered efficiently and effectively, and is reviewed on a regular basis. The program's quality management follows the Plan-Do-Check-Act model, applies standardized processes, and is designed to address the needs of defined target groups. The target groups of quality management include, internally, students and teaching staff, and, externally, society, industry, and public administration, including the labor market for program graduates.

In consideration of the defined target groups, six objectives are established for the quality of academic programs at TU Wien: (1) With regard to the quality and currency of the curriculum, the relevance of the qualification profile for society and the labor market is ensured. With regard to the quality of the curriculum's substantive implementation, (2) the learning outcomes in the curriculum modules are appropriately designed to realize the qualification profile, (3) learning activities and methods are appropriately selected to achieve the learning outcomes, and (4) assessments are suitable for verifying attainment of the learning outcomes. (5) With regard to the feasibility of completing the curriculum, the necessary framework conditions are in place to ensure this. (6) With regard to teachability, the teaching staff have the subject-matter and time resources required to ensure high-quality instruction.

To ensure the quality of the degree program, progress in the planning, development, and safeguarding of all six quality objectives is recorded separately and published. Quality assurance reviews the attainment of the six quality objectives. To assess the first and second quality objectives, the Academic Program Committee conducts a review of the qualification profile and the module descriptions at least once during each term of office. For the review of quality objectives two through five, the

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Ongoing evaluations by students, as well as individual feedback on academic operations submitted to the academic governing body, continuously provide an overall picture of how the curriculum is being implemented. This continuous review also serves to identify critical courses, for which appropriate adjustment measures are developed and implemented in coordination among the academic governing body, the curriculum committee, and the course coordinators_instructors. The sixth quality objective is addressed through quality-assurance instruments in the area of personnel. In addition to internal quality assurance, an external evaluation of the program is conducted every seven years.

§ 12 Entry into Force

This curriculum shall enter into force on October 1, 2026.

§ 13 Transitional Provisions

The transitional provisions are set out in Appendix B.

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A. Module Descriptions

The courses assigned to the modules are listed in the following format:

9.9/9.9 XX Course Title

In this notation, the first number indicates the scope of the course in ECTS credits, and the second indicates its scope in semester hours. ECTS credits measure students' workload; one academic year comprises 60 ECTS credits, and one ECTS credit corresponds to 25 hours of 60 minutes each. One semester hour corresponds to as many teaching units as there are teaching weeks in the semester. One teaching unit lasts 45 minutes. The course type (XX) is explained in detail in § 6 under *Course Types* on page 11.

Parameter Estimation

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-specific competencies: Upon successful completion of 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 principles of robust estimation methods, describe concepts such as auto-/cross-correlation, collocation, and regression, and explain the objectives and methods of geostatistics. Upon completion of the course, students will be able to identify and analyze parameter-estimation problems, independently formulate and solve adjustment tasks, and independently conduct statistical tests.

Content:

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

Expected Prior Knowledge:

Students are able to describe the mathematical foundations of geodesy and to articulate core statistical principles (including the least-squares method).

Required Prerequisites: None.

Teaching and Learning Methods Used and Appropriate Assessment: The teaching and learning methods applied must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be indicated.

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Module Courses:

3.0/2.0 Lecture: Parameter Estimation

3.0/2.0 Practical Exercise: Parameter Estimation

Seminars

Standard Workload: 6.0 ECTS

Learning Outcomes:

Interdisciplinary Competencies: Upon completion of this module, students will be able to present in-depth knowledge on an assigned seminar topic. Upon completion of the course, students will be able to identify specialized literature on a given topic, distinguish between methods or results presented in the literature, and synthesize multiple methods or findings. Students will be able to plan their studies and present an individualized master's degree study plan. Students will be able to present a scientific paper, respond appropriately to critical questions and argue their position, listen critically, engage in active discussion, and demonstrate an understanding of their discipline within a social context.

Content:

- Overview of the master's program and the individual master's degree study plan
- Selection of topics
- Presentation
- Where feasible, guest lectures by external experts on technical, economic, legal, and socio-political topics
- Discussion

Expected Prior Knowledge:

Students are able to describe the mathematical foundations of geodesy.

Students are able to use presentation software.

Students demonstrate curiosity and a willingness to engage with non-disciplinary yet relevant topics.

Mandatory Prerequisites: Participation in the *Introductory Seminar* requires active enrollment in the master's program in Geodesy and Geoinformation at TU Wien.

Teaching and Learning Methods and Appropriate Assessment:

The teaching and learning methods applied must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be specified.

Module Courses: Each seminar variant (Introductory Seminar, Seminar worth 2.0 ECTS, and Seminar worth 3.0 ECTS) may be used only once to fulfill the module requirements.

1.0/1.0 Seminar: Introductory Seminar

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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 intended to deepen subject-matter expertise and to develop interdisciplinary knowledge, skills, and competencies.

Content:

Expected prior knowledge: Depends on the selected courses.

Mandatory prerequisites: Depends on the selected courses.

Teaching and learning methods used, and appropriate assessment:
The teaching and learning methods applied must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination procedures must likewise be stated.

Module courses: The courses in this module may be freely selected from the range of scientific and artistic courses offered by all recognized domestic and international postsecondary educational institutions, provided that they serve to deepen subject-specific expertise or to develop interdisciplinary knowledge, skills, and competencies, with the stipulation that at least 4.5 ECTS must be chosen from the Transferable Skills subject areas; this also includes all courses in the module *Seminars*. For the Transferable Skills subject areas, courses from TU Wien's central elective course catalog for "Transferable Skills" are also specifically recommended.
If courses from other modules are completed for a higher ECTS total than is required for those modules, the number of ECTS to be completed within the module *Free Electives and Transferable Skills* is reduced by the same amount; however, a total of 4.5 ECTS from the Transferable Skills subject areas must, in any case, be completed within the master's program.

Applied Geoinformation

Standard Workload: 8.0 ECTS

Learning Outcomes:

Subject-Specific Competencies: After completing this module, students will be able to implement complex geoinformation applications using state-of-the-art methods, including AI-enhanced approaches.

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and web-based solutions. They will also be able to discuss and evaluate new approaches. Furthermore, students will be able to design, conduct, and document human-subject experiments related to mobile GIS and other mobile solutions. Upon completion of the courses, students will be able to analyze applications in practical contexts; design solutions using suitable technologies, such as AI components for spatial prediction or for communication and user interaction in a (Web)GIS; plan and conduct human-subject experiments; and prepare written reports, present their results, and defend their implementation.

Interdisciplinary Competencies: Students are able to implement solutions to practical problems, compare alternative solutions through human-subject experiments, and document and present their solutions and findings.

Content:

- Design, conduct, and document human-subject experiments (using, for example, eye tracking and IMU)
- Identify and discuss ethical considerations when evaluating solutions
- Key aspects of spatial human-computer interaction (for example, Augmented Reality)
- Implementation and integration of AI components in (Web)GIS: application areas and tools
- Fundamentals and use of Application Programming Interfaces (API)

Expected Prior Knowledge:

Students have foundational knowledge of GIS.

Students should have programming skills, preferably in Python.

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 prior to the start of the semester; the examination modalities must likewise be stated.

Courses in the Module:

1.0/1.0 Lecture: Implementation of a GIS

3.0/2.0 Practical Exercise: Implementation of a GIS

1.0/1.0 Lecture: Mobile GIS

3.0/2.0 Practical Exercise: Mobile GIS

Applied Cartography

Standard Workload: 7.5 ECTS

Learning Outcomes:

Subject-Specific Competencies: The courses in this module are taught in English. Students become familiar with the principles of extending cartographic communication processes into different

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media. They understand the concepts, constraints, and requirements of location-based services. They are able to implement and program components of cartographic information systems, particularly within the field of LBS.

Content:

- Concepts and components of Location-Based Services
- Positioning techniques for indoor and outdoor environments
- Data modeling for LBS
- LBS architecture
- Cartography for small-screen devices
- Application scenarios: navigation and wayfinding
- Extending cartographic communication processes across different media
- Cross-media publishing
- Programming methods 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 Methods Applied, and Appropriate Assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Courses in This Module:
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-Matter Competencies: Upon completion of the module, students are familiar with the key properties and processes of weather and the climate system. They understand the primary global drivers of climate change across different temporal and spatial scales. Students are able to select and apply suitable remote sensing techniques and datasets to observe climate and environmental change. They possess a foundational understanding of Earth system modeling and approaches to improving such models through the integration of Earth observations. Upon completion, students are able to recognize and disentangle complex, nonlinear interactions within the Earth system and to develop well-founded solutions—drawing on Earth observations, Earth system modeling, and model–data integration—to quantify change. Students are able to use

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Python for processing and analyzing global Earth observation datasets, as well as for introductory Earth system modeling. *Interdisciplinary Competencies:* Students are able to work both independently and collaboratively to address problems, implement processing workflows, prepare 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 investigating climate and environmental variability and change
- Theory and applications of stochastic and process-based Earth system modeling, with an emphasis on hydrologic, land-surface, and climate models
- Model–data integration to enhance Earth system modeling

Expected Prior Knowledge:

Students have strong Python programming skills and bring practical knowledge of mathematics, physics, and computer science to the lectures. Familiarity with remote sensing theory is required. Prior exposure to microwave remote sensing and pattern-recognition methods is advantageous.

Students are able to develop creative solutions for processing tasks, as well as for data exploration and analysis. They are able to present results to an audience and engage in critical discussion.

Students are able to work effectively in teams and manage tasks in accordance with the schedule.

Mandatory Prerequisites: None.

Teaching and Learning Methods and Appropriate Assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course before the start of the semester; the examination modalities must likewise be stated.

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

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: Students are able to select and apply photogrammetric and remote sensing techniques for observing the Earth. They are able to work with multispectral

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Imaging, LiDAR, and radar data are used to monitor environmental processes and urban areas. Based on the requirements of the intended application, students shall be able to select the most suitable Earth observation technologies and processing methods. They possess practical expertise in processing airborne laser scanning data, multispectral imagery, and microwave measurements.

Interdisciplinary Competencies: Students are able to work effectively in teams to solve problems, implement processing workflows, and prepare 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 of dynamic hydrologic processes

Expected Prior Knowledge:

Students are expected to have a solid working knowledge of mathematics, physics, and computer science. Familiarity with remote sensing theory, microwave remote sensing, and pattern recognition methods is advantageous.

Students possess computer proficiency.

Students are able to complete tasks on schedule, develop well-considered solutions for SAR processing tasks, conduct data exploration and analysis, and present results.

Mandatory Prerequisites: None.

Teaching and Learning Methods Applied, and Appropriate Assessment:

The teaching and learning methods applied shall be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities shall be specified as well.

Module Courses:
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: Students are able to describe space-geodetic techniques from both theoretical and practical perspectives, as well as their applications in geodesy, geodynamics, astronomy, and weather forecasting. They understand the various physical and geometric methods used in space geodesy. Students are able to address space-geodetic tasks as required.

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in professional and scientific contexts. They understand the concept of reference frames and their use in positioning and navigation. *Interdisciplinary Competencies:* Students demonstrate proficiency in planning, coordination, and project management.

Content:

- Theory and practical application of modern space-geodetic techniques (VLBI, Satellite and Lunar Laser Ranging, GNSS, DORIS, satellite altimetry, space gravity missions)
- Global terrestrial and celestial reference frames
- Atmospheric effects on space-geodetic observations
- Assimilation of tropospheric delays in numerical weather models
- Execution of all steps required for geodetic Very Long Baseline Interferometry

Expected Prior Knowledge: Fundamental knowledge of Higher Geodesy.

Mandatory Prerequisites: None.

Teaching and Learning Methods Applied, and Appropriate Assessment:

The teaching and learning methods applied must be specified in the Studies and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module Courses:

3.0/2.0 Lecture: Modern Space Geodetic Techniques
3.0/2.0 Lecture with Integrated Practice: 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: Upon completion of 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 establish interfaces between engineering geodesy and related disciplines such as civil and mechanical engineering. In addition, students will be able to independently plan and execute demanding metrological tasks in engineering geodesy, design and implement specialized engineering-geodetic sensor systems, and autonomously expand their knowledge on the basis of specialized scientific literature.

Interdisciplinary Competencies: Students will be able to lead interdisciplinary teams in the execution of demanding metrological tasks.

Content:

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- Static and dynamic characteristics of sensors
- Principles, design, and characteristics of sensors and sensor systems for structural monitoring (strain gauges, inclinometers, pendulum-based measurement systems) 26
- Operating 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 identification, localization, and modeling of deformations within a geodetic network
- Hands-on measurements using the sensors and sensor systems listed above

Expected prior knowledge: The following foundational knowledge may be acquired within a bachelor's degree program in Geodesy and Geoinformation, as well as in the module *Parameter Estimation*.

Students will be able to describe and apply parameter estimation and quality assurance in linear models of quasi-static networks. They are familiar with fundamental concepts in statistics and engineering geodesy. They can operate the instruments and explain methods used in applied geodesy.

Students are able to operate basic geodetic metrology equipment, prepare technical reports, and perform straightforward technical tasks in the field of applied geodesy.

Students are able to work effectively in a group.

Mandatory prerequisites: None.

Applied teaching and learning methods and appropriate assessment:

The teaching and learning methods applied must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Courses within the module:

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

Real Property and Cadastre

Standard workload: 7.5 ECTS

Learning outcomes:

Subject-matter competencies: Upon successful completion of this module, students will be able to understand and present the law of property, in particular real estate law, rights in real property and their public notice, legal transactions involving real property and their execution, as well as the technical aspects of executing such legal transactions. After

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Upon successful completion of the courses, students are able to convey the relevant provisions of federal and state legislation applicable to the preparation of subdivision plans for building land, including practical examples of application. *Interdisciplinary competencies:* Students have command of the fundamentals of team leadership within a civil engineering consultancy 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 cadastre; fundamentals of administrative procedure
- Historical development of the cadastre; responsibilities and competencies in the Austrian cadastre; the tasks and role of the BEV
- Cadastre procedures and processes with due regard to the land register; the control-point network; development of the cadastral map; structure and administration of the land parcel database
- Land-use plan pursuant to the Vienna Building Code and the Lower Austrian Spatial Planning Act: procedures; contents of a development plan
- Building regulations: content; permitted use; building moratorium; amendments; publication of development provisions
- Subdivision plan pursuant to the Vienna and Lower Austrian Building Codes: requirements; assessment; land dedication; building prohibitions; lapse of subdivision approval; boundary correction; expropriation; adjoining-owner contributions; compensation; permissible building-site utilization

Expected prior knowledge:

Students possess knowledge of the rules and procedures for drafting land-use plans, building regulations, and subdivision plans.

Students are able to prepare subdivision plans.

Mandatory prerequisites: None.

Teaching and learning methods applied, and appropriate assessment: The courses in this module are conducted in German.

The teaching and learning methods applied must be specified in the Studies and Teaching information system for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module courses:

3.0/2.0 Lecture: Real Property Law

1.5/1.0 Lecture: Advanced Cadastre

3.0/2.0 Practical Exercise: Advanced Cadastre

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Microwave Remote Sensing

Standard workload: 6.0 ECTS

Learning Outcomes:

Subject-Specific Competencies: Students are able to describe the physical principles underlying 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 governing microwave scattering and emission from the Earth's surface. Upon completion of the module, students are able to demonstrate a sound theoretical understanding of measurement principles and areas of application, and they have practical experience in processing SAR data and preparing reports based on these data.

Interdisciplinary Competencies: Students are able to work effectively in teams to address complex SAR processing tasks.

Content:

- Electromagnetic waves
- Sources and detection of microwaves
- 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 are expected to bring practical knowledge of mathematics, physics, and computer science to the lectures. Familiarity with remote sensing theory is an advantage.

Students possess computer proficiency.

Students are able to complete tasks on schedule and to develop well-reasoned solutions for SAR processing tasks, including data exploration and analysis.

Mandatory Prerequisites: None.

Teaching and Learning Methods and Appropriate Assessment: The teaching and learning methods applied must be specified in the Studies and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module Courses:

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

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Advanced Photogrammetry

Standard Workload: 6.0 ECTS

Learning Outcomes:

Disciplinary Competencies: Students are able to explain the mathematical and geometric foundations of photogrammetry and laser scanning within the context of observation models, parameter estimation, and georeferencing of hybrid observations. For imagery, they are also able to explain the computation of image orientation, shape parameters, and point positions, as well as the corresponding accuracies. Students are able to extract geometric information from images and laser-scanning data. They can describe, analyze, and evaluate quality measures for estimated parameters in order to assess data quality on the basis of adjustment theory.

Interdisciplinary Competencies: Work effectively in small teams.

Course Content:

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

Expected Prior Knowledge:

Students are expected to have practical knowledge of linear algebra, parameter estimation, adjustment computations, camera modeling, and methods for photo orientation.

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

Mandatory Prerequisites: None.

Teaching and Learning Methods and Appropriate Assessment:

The teaching and learning methods applied must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module Courses:

3.0/2.0 Lecture Advanced Photogrammetry
3.0/2.0 Exercise Advanced Photogrammetry

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Law and Economics

Standard workload: 5.0 ECTS

Learning outcomes:

Subject-specific competencies: Upon completion of this module, students are able to identify and comply with the rules applicable to operating a business—particularly a civil engineering office in Austria—and to describe and explain key aspects of construction and planning law. After completing the courses, students are able to analyze economic matters and address issues that arise in managing a civil engineering office, including, in particular, assessing and resolving planning problems presented by clients.

Interdisciplinary competencies: Students have command of the fundamentals of team leadership within a civil engineering office.

Content:

- Statutory framework for civil engineers_in Austria: fields of practice, training requirements, and admission criteria
- Business structures for professional practice: sole proprietorships, partnerships, and corporate formations
- Overview of business administration: cameralistics, rates, fees, charges, remuneration, office organization, key metrics for a civil engineering office, and relevant aspects of labor law
- Fundamentals of construction law and an overview of Austrian building and planning law, including allocation of responsibilities, delineation of competences, permitting procedures, substantive building law, and legal protection
- Core principles of planning law: objectives and measures of regional and municipal spatial planning
- Interdependencies between building-law and planning-law provisions

Expected prior knowledge:

Students have foundational knowledge of constitutional and administrative law, business administration, and the cadastre. Familiarity with real property law is advantageous.

Mandatory prerequisites: None.

Teaching and learning methods applied and appropriate assessment: The courses in this module are conducted in German.

The teaching and learning methods used must be specified in the Studies and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module Course Offerings:

3.0/2.0 Integrated Course (VU): Management of a Civil Engineering Office

2.0/2.0 Lecture (VO): Construction and Planning Law

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Gravity Field and Earth's Rotation

Standard Workload: 9.0 ECTS

Learning Outcomes:

Subject-Specific Competencies: Students are able to describe how the global static and time-varying gravity field is determined using satellite gravimetry, evaluate the resulting products, and explain their applications. They possess both theoretical and practical knowledge of observing and modeling variations in Earth's rotation. Students are able to use real and simulated data to apply and further develop their expertise in Earth's gravity field and rotation.

Interdisciplinary Competencies: Students are able to work through the lecture content and present their results.

Content:

- Theory and mathematical representation of the gravity field
- Fundamentals of satellite gravimetry
- Global gravity field models
- Theory of Earth's rotation
- Variations in length of day, polar motion, and nutation
- Observation of Earth's rotation
- Tidal effects on Earth's rotation and interactions within the Earth system

Expected Prior Knowledge:

Students have foundational knowledge of physics (mechanics), mathematics, and higher geodesy. Students also have strong spatial reasoning skills.

Mandatory Prerequisites: None.

Teaching and Learning Methods Applied, and Appropriate Assessment:

The teaching and learning methods applied must be specified in the Information System for Studies and Teaching for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module Courses:

3.0/2.0 VO Satellite Gravimetry: Methods and Applications
1.5/1.0 UE Satellite Gravimetry: Methods and Applications
3.0/2.0 VO Earth Rotation and Global Dynamic Processes
1.5/1.0 UE Earth Rotation and Global Dynamic Processes

Statistical Pattern Recognition

Standard Workload: 6.0 ECTS

Learning Outcomes:

Subject-Specific Competencies: Upon completion of this module, students are able to explain the theoretical foundations of statistics as well as the methods used to evaluate classification results.

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They can present an overview of the principal methods used in statistical pattern recognition. Upon successful completion of the course, students will be able to select appropriate statistical pattern recognition methods for a given problem and implement classification procedures.

Content:

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

Expected prior knowledge:

Students are familiar with fundamental concepts in statistics (including the normal distribution and measures of a distribution) as well as linear algebra.

Students are able to program.

Mandatory prerequisites: None.

Teaching and learning methods applied, and appropriate assessment:

The teaching and learning methods applied must be specified in the Studies and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Courses within the module:
6,0/4,0 VU Statistical Pattern Recognition

Theoretical Cartography

Standard workload: 6,0 – 9,0 ECTS

Learning outcomes:

Subject-matter competencies: Students are able to describe the principal theories and methods of scientific cartography. They can understand cartographic modeling methodologies in the areas of generalization, visualization, and interactivity. They can describe the principles of cartographic data handling 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

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Required prerequisites: None.

Applied teaching and learning methods and appropriate assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the same applies to the examination modalities.

Module courses: Lectures totaling at least 6.0 ECTS must be selected from the list below:

3.0/2.0 VO Theoretical Cartography
3.0/2.0 VU Cartographic Interfaces
3.0/2.0 VU Cartographic Information Systems

Advanced Geoinformation

Standard workload: 8.0 ECTS

Learning outcomes:

Subject-specific competencies: After completing this module, students will be able to explain the theoretical foundations of geoinformation processing and the mathematical and formal methods used in spatial information computing across a range of domain-specific applications (e.g., disaster management, geosimulations, multi-criteria decision-making). Students will be able to understand and make well-founded decisions regarding the use of Geospatial AI methods (i.e., GeoAI). In addition, they will gain knowledge of state-of-the-art computational geometry algorithms for solving various classes of geometric problems, including the ability to implement selected algorithms. Upon completion of the courses, students will be able to relate geospatial and mathematical theories to application programming.

Content:

- Introduction to Geospatial AI (GeoAI)
- GIS-based problem solving for selected advanced geospatial topics (e.g., disaster management, multi-criteria decision making, 3D analytics)
- Fundamental principles of geometric algorithms
- Vector algebra for coordinate calculation
- Projective geometry for determining line intersections and managing surface partitions
- Simplices and simplicial complexes for representing geometric figures

Expected prior knowledge:

The students should have a strong working knowledge of Python programming.

Required prerequisites: None.

Applied teaching and learning methods and appropriate assessment:

The teaching and learning methods used are listed in the Study and

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To be specified for each course prior to the start of the semester; likewise, the examination modalities.

Courses within the module:
4.0/3.0 VU Advanced GIS and GeoAI
4.0/3.0 VU Geometrical Algorithms for GIS

Areal and Kinematic Measurement Methods in Engineering Geodesy

Standard workload: 6.0 ECTS

Learning outcomes:

Subject-specific competencies: After completing this module, students will be able to report on current research and developments in the field of engineering geodesy. Students will be able to plan and carry out a research and development project in engineering geodesy, critically evaluate specified requirements or framework conditions, develop proposals for appropriate adjustments, and present and discuss their own work as well as the work of others. *Interdisciplinary competencies:* Students are able to manage a research and development project and to identify and resolve critical situations within an R&D project. They demonstrate an awareness of costs and quality and are also able to complete projects under time pressure.

Content:

- Fundamentals, design, and characteristics of sensors and sensor systems for industrial metrology and for areal geometry capture (laser tracking; terrestrial and close-range laser scanning)
- Advanced methods for processing areal data (estimation of regular 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 the results

Expected prior knowledge:

Students will possess in-depth knowledge of the methods and sensors used in engineering geodesy.

Students are able to plan and carry out demanding technical tasks, independently acquire knowledge using specialized literature, and prepare technical reports. They can solve problems with the support of a scripting language.

Students are able to organize themselves effectively in teams and carry out demanding technical tasks in the field of engineering geodesy.

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Mandatory prerequisites: None.
Applied teaching and learning methods and appropriate assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module courses:
3.0/2.0 VU Geometric Shape Determination in Engineering Geodesy
3.0/2.0 VU Selected Topics of Engineering Geodesy

Geo-Data and Data Processing

Standard workload: 6.0–9.0 ECTS
Learning outcomes:

Subject-specific competencies: Students are able to explain quality parameters and standards for geo-data and to discuss their limitations. Furthermore, they can describe and apply methods for processing, analyzing, and visualizing geo-data of varying size, scope, and complexity, including point cloud data. Students gain a broad overview of common data standards and geo-data processing workflows. They are able to read and critically discuss relevant literature in the field. They can select appropriate software and methods to visualize datasets of different sizes and levels of complexity, including associated quality measures. They are able to use statistical and point-cloud processing software to analyze large datasets.

Interdisciplinary competencies: Students are able to evaluate data quality and to determine suitability for specified applications on the basis of quality measures.

Content:

- Quality parameters
- Quality standards
- Description and discussion of the limitations of quality concepts
- Overview of point clouds and feature extraction
- Segmentation and classification of point clouds
- Graphical data visualization
- Regression

Expected prior knowledge:

Students are familiar with the fundamentals of statistics, linear algebra, and geospatial coordinate systems.

Students are able to work with geo-data.

Mandatory prerequisites: None.
Applied teaching and learning methods and appropriate assessment:

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the examination modalities must likewise be stated.

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

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: 6.0–8.0 ECTS

Learning outcomes:

Subject-specific competencies: Upon completion of this module, students are able to explain specialized and advanced mathematical concepts and to demonstrate in-depth knowledge. They can solve typical numerical problems, ranging from theoretical to practice-oriented applications. Students are able to apply alternative computational methods. They understand the standard calculation approaches used in geodesy. They can independently complete small projects (partly using a computer).
Interdisciplinary competencies: Students are able to propose alternative solutions.

Content:

- Graph theory and elements of topology
- Introduction to numerical methods: error analysis—model errors, procedural errors, rounding errors; condition number (sensitivity of the solution to changes in input information)
- Linear systems of equations, linear fitting, nonlinear systems of equations
- Interpolation, best approximation
- Numerical quadrature—Newton–Cotes formulas, Gaussian quadrature
- Numerical solutions of ordinary differential equations

Expected prior knowledge:

Students have a foundational knowledge of mathematics.

Required prerequisites: None.

Teaching and learning methods used, and appropriate assessment:

The teaching and learning methods applied must be specified for each course in the Studies and Teaching Information System prior to the start of the semester; the examination modalities must also be stated.

Module courses:

2.0/1.5 Integrated Course: Discrete Mathematics for Geodesy and Geoinformation

6.0/4.0 Integrated Course: Numerical Computation

The course 6.0/4.0 Integrated Course *Numerical Computation* is required.

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Supplementary Specialization

Standard workload: 4.0–10.0 ECTS

Learning outcomes: Any course explicitly listed in this curriculum that has been completed in addition is recognized as a course for this module.

Content: Depending on the selected courses.

Expected prior knowledge: Depending on the selected courses.

Mandatory prerequisites: Depending on the selected courses.

Applied teaching and learning methods and appropriate assessment procedures:

The teaching and learning methods applied must be specified for each course in the Study and Teaching Information System prior to the start of the semester; the examination modalities must likewise be stated.

Module courses: Any course explicitly listed in this curriculum that has been completed in addition to the required coursework—i.e., not otherwise applied toward the degree program—will be recognized as a course for this module. It is not necessary to submit complete modules. In addition, courses completed during a period of study abroad (e.g., within the ERASMUS program) may be submitted if no equivalent is provided for in the curriculum, provided that they nonetheless constitute a subject-specific deepening of the degree program. Courses totaling at least 4.0 ECTS, and no more than 10.0 ECTS, must be selected.

Environment

Standard workload: 6.0–9.0 ECTS

Learning outcomes:

Subject-Specific Competencies: Upon completion of this module, students will be able to develop and explain an understanding of interdisciplinary environmental issues, such as climate change, atmospheric processes, and the interdependencies between effective environmental protection and the legal framework. They can report on current developments at the international and European levels, as well as their impacts in Austria. Students will be able to connect discipline-specific knowledge and identify innovative solutions to cross-cutting challenges at the intersection of technology, law, and practical applications.

Interdisciplinary Competencies: Students are able to contribute constructively to discussions and to recognize the advantages and disadvantages of different problem-solving approaches.

Content:

- Earth observation and GIS for monitoring environmental change
- Global environmental topics, including climate and the greenhouse effect

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- Structure and dynamics of Earth's atmosphere, and the physical relationships relevant to climate
- Fundamentals and instruments of environmental
- Overview of specific legal fields: general environmental law; climate protection under the Kyoto Protocol; commercial law; waste law; water law; forestry law; mining law; spatial planning law; construction law; nature conservation law; EU environmental law; and international environmental law.

Expected prior knowledge:

Students are expected to have foundational knowledge of physics, geodesy, geoinformation, and Earth observation.

Students are able to think in a problem-focused and structured manner in order to address environmental topics.

The students have a strong interest in environmental topics.

Mandatory prerequisites: None.

Teaching and learning methods applied, and appropriate assessment: Some of the courses in this module are conducted in German.

The teaching and learning methods used must be specified in the Study and Teaching Information System for each course prior to the start of the semester; the same applies to the examination modalities.

Courses within the module: Courses totaling at least 6.0 ECTS must be selected from the following list:

3.0/2.0 VU Global Change Monitoring
3.0/2.0 VO Physics of the Atmosphere
3.0/2.0 Lecture: Legal Issues in Environmental Protection

Environmental Geophysics

Standard Workload: 6.5–9.5 ECTS

Learning Outcomes:

Subject-Specific Competencies: After completing this module, students are able to design geophysical surveys and analyze geophysical signatures to investigate environmental processes. Students are able to understand the physical principles underlying various geophysical methods and their application in characterizing environmental processes. The module includes numerical and field-based exercises to develop the skills required to design geophysical surveys and to interpret results.

Interdisciplinary Competencies: Students work in teams to develop solutions to a range of environmental questions using geophysical methods. Through presentations, students learn to communicate geophysical results to audiences with diverse backgrounds, including other geoscientists.

Content:

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- Developing an understanding of the mechanistic models that explain geophysical signatures associated with hydrogeological processes
- Collection of field measurement data
- Processing and analysis of field and numerical data
- Modeling and inversion of geophysical imaging datasets
- Application of petrophysical models for the quantitative interpretation of geophysical results
- Integration of geophysical findings into environmental and engineering studies

Expected prior knowledge:

Students are expected to have a solid understanding of fundamental concepts in physics and mathematics. Experience with Python scripting is beneficial for successfully completing this module.

Students are interested in understanding the relationship between physical properties and environmental processes.

Students have an interest in environmental and Earth science topics.

Required prerequisites: None.

Instructional and learning formats, and appropriate assessment methods:

The instructional and learning formats must be specified in the academic information system for each course prior to the start of the semester; the examination modalities must likewise be stated.

Courses within the module: Courses totaling at least 6.5 ECTS must be selected 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: Students are able to describe methods and techniques for global and local navigation. They are able to 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:* Students are able to analyze, evaluate, and explain current research.

Content:

- Space geodetic sites

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- Inertial sensors and multi-sensor systems
- Overview of static point positioning with satellite
- GNSS reference station networks and regional satellite navigation services
- Global GNSS services (IGS, EUREF)
- Fundamentals of astronomy

Expected prior knowledge:

Presentations and performance evaluation through oral examinations and presentations. Visit to a space geodetic station.

Mandatory prerequisites: None.

Applied teaching and learning methods and appropriate assessment:

The teaching and learning methods applied must be specified in the information system for studies and teaching for each course prior to the start of the semester; the examination modalities must likewise be stated.

Module courses: Courses totaling at least 7.5 ECTS must be selected from the following list.

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 otherwise specified, the term *degree program* as used below refers to the Master's Program in Geodesy and Geoinformation (program code UE 066 421). The term new curriculum refers to the curriculum for this program at TU Wien that is effective as of 10/1/2026; the term old curriculum refers to the curriculum in effect until that date. Accordingly, new and old courses are those assigned to the new or old curriculum, respectively (with "old" also encompassing earlier curricula). The term 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 degree completion at TU Wien under the new curriculum and who were admitted to the Master's Program in Geodesy and Geoinformation at TU Wien before 7/1/2026. The extent to which these students make use of the transitional provisions is at their discretion.

3. Upon the student's request, the academic body responsible for study law matters may modify the transitional provisions on an individual basis or extend them to students not covered by Paragraph 2.

4. Certificates for courses that are equivalent in content may not be submitted simultaneously for the degree completion. In cases of doubt, the academic body responsible for study law matters shall decide on equivalence.

5. Unless otherwise specified below, certificates for courses under the previous curriculum may in any case be used for degree completion, provided that the course was completed by the student in Summer Semester 2026 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" in the amount of 12 ECTS credits toward completion of the degree.

7. Final examinations for courses shall be conducted in the language of instruction of the respective course. Deviations are permitted provided that timely arrangements have been made with the examiners. In accordance with the study-law provisions of the Statutes of TU Wien, assessment shall be based on the achievement of the educational objectives and 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 1 July 2025, completion of the course *1.0/1.0 SE Introductory Seminar* is not mandatory. If the course is not completed, it may be counted toward 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 (*previous* or *revised*) is described by its scope in ECTS credits (first number) and semester contact hours (second number), as well as its type and title. The ECTS credit value of the course actually completed shall be the one that applies.

   The courses shown on the left side of the table below refer to the previous courses. The right side lists the course combinations for which the respective previous course (or combination of previous courses) may be used. Course offerings (or combinations thereof) listed under the same item in the equivalency tables shall be regarded as 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 in 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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Previous	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
6,0/4,0 VU Selected Topics in Engineering Geodesy	6,0/4,0 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 Processing of Geophysical Data	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 Systems and Services	3,0/2,0 VO Satellite Navigation Systems and Services
1,5/1,0 EX Field Excursion: Space Geodesy	1,5/1,0 EX Field Excursion: Space Geodesy
3,0/1,0 VO Management of a Licensed Engineering Consultancy	3,0/2,0 VU Management of a Licensed Engineering Consultancy _Office
3,0/2,0 VO Statistical Pattern Recognition 3,0/2,0 UE Statistical Pattern Recognition	6,0/4,0 VU Statistical Pattern Recognition
3,0/2,0 VO Earth's Gravity Field	3,0/2,0 VO Satellite Gravimetry: Methods and Applications
1,5/1,0 UE Global Gravity Field Models	1,5/1,0 UE Satellite Gravimetry: Methods and Applications
3,0/2,0 VU Discrete Mathematics for Computer Science	2,0/1,5 VU Discrete Mathematics for Geodesy and Geoinformation
5,5/4,0 VU Numerical Computation	6,0/4,0 VU Numerical Computation
4,0/3,0 VU Advanced GIS	4,0/3,0 VU Advanced GIS and GeoAI

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10. If only one of the two certificates *3.0/2.0 VO Statistical Pattern Recognition* or *3.0/2.0 UE Statistical Pattern Recognition* has been obtained, it may, by arrangement with the course instructors and the responsible academic authority, be credited as a completed partial requirement toward the *6.0/4.0 VU Statistical Pattern Recognition* .

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C Semester-by-Semester Structure of Course Offerings

Several courses are listed across more than one of the first three semesters. Students are expected to develop a semester plan that best suits their needs based on the courses offered each term; this planning should also take into account the courses not listed here that must be completed within the modules of the examination subject *Broadening in Subjects of Geodesy and Geoinformation* as well as within the required module *Free Electives and Transferable Skills* .
Students are advised to select courses in a manner that ensures the workload remains manageable in each respective semester.

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 Chartered Engineering Consultancy 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 LEC Microwave Remote Sensing

3.0 EX Microwave Remote Sensing

6.0 LEC/EX Statistical Pattern Recognition

4.0 LEC/EX Advanced GIS and GeoAI

2.0 LEC/EX Discrete Mathematics for Geodesy and Geoinformation

3.0 LEC/EX Point Cloud Processing

3.0 LEC Data Quality

3.0 LEC Astronomy

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3.0 Lecture Navigation 47

3.0 Lecture Exploration Using Electric and Electromagnetic Methods

2.0 Practical: Geophysical Data Processing

3.0 Integrated Course: Global Change Monitoring

3.0 Lecture Physics of the Atmosphere

2nd Semester (SS) **30 ECTS**

One of the following three seminars:

2.0 Seminar: Geodesy, Engineering Geodesy, and Geophysics

2.0 Seminar: Photogrammetry and Remote Sensing

2.0 Seminar: Geoinformation and Cartography

3.0 Seminar Seminar in Geosciences

4.5 Lecture Advanced Engineering Geodesy

1.5 Practical Advanced Engineering Geodesy

3.0 Lab: Measurement Exercise in Engineering Geodetic Metrology

2.0 Lecture Construction and Planning Law

3.0 Lecture Satellite Gravimetry: Methods and Applications

1.5 Practical Satellite Gravimetry: Methods and Applications

3.0 Integrated Course: Applied Earth Observation

3.0 Integrated Course: Data Retrieval in Earth Observation

3.0 Lecture Advanced Photogrammetry

3.0 Practical Advanced Photogrammetry

4.0 Integrated Course Geometric Algorithms for GIS

3.0 Lecture Theoretical Cartography

3.0 Integrated Course Cartographic Interfaces

3.0 Integrated Course Cartographic Information Systems

4.5 Integrated Course Location-Based Services

3.0 Integrated Course: Programming Cartographic Tasks

6.0 Integrated Course: Numerical Computation

3.0 Integrated Course Statistical Computing

3.0 Integrated Course: Geometric Shape Determination in Engineering Geodesy

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3.0 VO Satellite Navigation Systems and Services
1.5 EX Field Excursion: Space Geodesy 48
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 Remote Sensing for Climate and Environmental Applications
2.0 VO Introduction to Meteorology and Climatology

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

3.0 SE Seminar in the 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 Management of a Chartered Engineering Consultancy Office
3.0 VO Earth Rotation and Global Dynamic Processes
1.5 UE Earth Rotation and Global Dynamic Processes
1.0 VO GIS Implementation
3.0 UE GIS Implementation
1.0 VO Mobile GIS
3.0 UE Mobile GIS
3.0 VO Real Property Law
1.5 VO Advanced Cadastre Studies
3.0 UE Advanced Cadastre Studies
2.0 VU Discrete Mathematics for Geodesy and Geoinformation
3.0 VU Point Cloud Processing
3.0 VO Data Quality
3.0 VU Selected Topics in Engineering Geodesy
3.0 VO Astronomy
3.0 VO Navigation
3.0 VU Global Change Monitoring
3.0 VO Atmospheric Physics
3.0 VU Model–Data Integration in Earth System Science

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Diploma Thesis	27.0 ECTS
Final Examination Board Review	3.0 ECTS

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D Semester Recommendation for Students Entering Off-Cycle

Students who begin their studies in the summer semester may experience disadvantages with respect to the overall duration of their program. At the start of the program, it is advisable to attend courses for which no significant comprehension difficulties are expected if qualifications acquired in prior courses are not yet in place; for example, courses from the *Elective Courses and Transferable Skills* module are recommended.

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E Recommendations for Students Pursuing a Career as an Engineering Consultant_ for Surveying in Austria

Under the Civil Engineers Act (1993, as amended 1/2013), Section 4(2)(b), "engineering consultants for surveying" are authorized to prepare subdivision plans for the cadastral and land-register division of parcels, as well as site plans for the land-register removal of entire parcels; to determine boundaries based on the current cadastral map or on the basis of documents, including boundary marking; and to prepare plans for the publication of building lines. This requires not only appropriate technical and professional training, but also a solid command of the necessary legal foundations. Successful completion of the civil engineer_ examination is a prerequisite for a career as an engineering consultant_. The required fields of knowledge are set out in Sections 9(3) and (4) of the Civil Engineers Act.

Because the current curriculum affords students considerable flexibility in defining their area of specialization, the Federal Chamber of Civil Engineers has prepared recommendations for prospective_ candidates pursuing a career as an engineering consultant_ for surveying, so that they may already be prepared for the civil engineer_ examination through their studies. Accordingly, students should cover as many of the required areas as possible through elective modules and courses within the degree program and, where necessary, through free electives. The following proposals are listed below:

Field of Knowledge for the Civil engineer_ examination	Curriculum Alignment
Earth's Gravity Field	Foundational coursework in the bachelor's program *Geodesy and Geoinformation*through the required module *Fundamentals of Higher Geodesy*, or further specialization in this master's program through the elective module *Gravity Field and Earth Rotation*
Real Property and Cadastre	Foundational coursework in the bachelor's program *Geodesy and Geoinformation*through the required module *Law and Science*; In this master's program through an elective module *Real Property and Cadastre*
Constitutional and Administrative Law	Foundational coursework in the bachelor's program *Geodesy and Geoinformation* through the required module *Law and Science*
Construction and Planning Law	Elective module *Law and Economics*
Business Administration	Elective module *Law and Economics*

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Completion of the elective module Real Property and Cadastre is, in any event, required for admission to the civil engineer licensure examination_ examination. Although addressed only in an encyclopedic manner in this curriculum, knowledge of real property valuation, applied administrative law for technical professionals, fundamentals of land register law, spatial planning, fundamentals of road/rail/tunnel construction, the structure of Austrian building law, standardization, and public procurement is essential for obtaining authorization as a civil engineer_professional. It is therefore recommended that you complete as much relevant coursework as possible within the *Elective Courses and Transferable Skills* module, drawing on offerings from TU Wien or other universities.

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F Examination Subjects with the Assigned Required Modules and Courses

Examination Subject “In-depth Study of Fundamentals” (12,0 ECTS)

Module “Parameter Estimation” (6,0 ECTS)

3,0/2,0 Lecture Parameter Estimation
3,0/2,0 Practical Exercise Parameter Estimation

Module “Seminars” (6,0 ECTS)

1,0/1,0 Seminar Introductory Seminar
2,0/1,0 Seminar Seminar in Geodesy, Engineering Geodesy, and Geophysics
2,0/1,0 Seminar Seminar in Photogrammetry and Remote Sensing
2,0/1,0 Seminar Seminar in Geoinformation and Cartography
3,0/2,0 Seminar Seminar in Geosciences

Examination Subject “Specialization in Geodesy and Geoinformation” (44-54 ECTS)

Module “Applied Geoinformation” (8,0 ECTS)

1,0/1,0 Lecture Implementation of a GIS
3,0/2,0 Practical Exercise Implementation of a GIS
1,0/1,0 Lecture Mobile GIS
3,0/2,0 Practical Exercise Mobile GIS

Module “Applied Cartography” (7,5 ECTS)

4,5/3,0 Integrated Course Location-based Services
3,0/2,0 Integrated Course Programming Cartographic Tasks

Module “Earth Observation” (7,5 ECTS)

1,5/1,0 Integrated Course Introduction to Earth Observation
3,0/2,0 Integrated Course Applied Earth Observation
3,0/2,0 Integrated Course Data Retrieval in Earth Observation

Module “Climate and Environmental Remote Sensing” (6,0 -8,0 ECTS)

3,0/2,0 Integrated Course Climate and Environmental Remote Sensing
2,0/1,5 Lecture Introduction to Meteorology and Climatology
3,0/2,0 Integrated Course Model-Data Integration in Earth System Science

Module “Space Geodesy” (9,0 ECTS)

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

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1,5/1,0 UE Atmospheric Effects in Space Geodesy

Module "Advanced Engineering Geodesy" (9,0 ECTS)

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

Module "Real Property and Cadastre" (7,5 ECTS)

3,0/2,0 Lecture Real Property Law
1,5/1,0 Lecture Advanced Cadastre
3,0/2,0 Practical Course Advanced Cadastre

Module "Microwave Remote Sensing" (6,0 ECTS)

3,0/2,0 Lecture Microwave Remote Sensing
3,0/2,0 Practical Course Microwave Remote Sensing

Module "Advanced Photogrammetry" (6,0 ECTS)

3,0/2,0 Lecture Advanced Photogrammetry
3,0/2,0 Practical Course Advanced Photogrammetry

Module "Law and Economics" (5,0 ECTS)

3,0/2,0 Integrated Course Management of a Chartered Engineering Office
2,0/2,0 Lecture Construction and Planning Law

Module "Gravity Field and Earth Rotation" (9,0 ECTS)

3,0/2,0 Lecture Satellite Gravimetry: Methods and Applications
1,5/1,0 Practical Course Satellite Gravimetry: Methods and Applications
3,0/2,0 Lecture Earth Rotation and Global Dynamic Processes
1,5/1,0 Practical Course Earth Rotation and Global Dynamic Processes

Module "Statistical Pattern Recognition" (6,0 ECTS)

6,0/4,0 Integrated Course Statistical Pattern Recognition

Module "Theoretical Cartography" (6,0 – 9,0 ECTS)

3,0/2,0 Lecture Theoretical Cartography
3,0/2,0 Integrated Course Cartographic Interfaces
3,0/2,0 Integrated Course Cartographic Information Systems

Module "Advanced Geoinformation" (8,0 ECTS)

4,0/3,0 Integrated Course Advanced GIS and GeoAI
4,0/3,0 Integrated Course Geometric Algorithms for GIS

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Examination 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" (6.0–8.0 ECTS)

2.0/1.5 VU Discrete Mathematics for Geodesy and Geoinformation
6.0/4.0 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 Physics of the Atmosphere
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 Electrical 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 Excursion: Space Geodesy

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

Module "Electives and Transferable Skills" (9.0 ECTS)

Examination Subject "Diploma Thesis" (30.0 ECTS)

27.0 ECTS Diploma Thesis
3.0 ECTS Final Examination Before a Committee

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