

Note:

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Curriculum for the
Bachelor’s Programme in Environmental Engineering
at the Faculty of Engineering Sciences of the University of Innsbruck

(New release 2025)

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§ 1 Allocation of the study programme

Pursuant to §54 Universities Act 2002, the Bachelor's Programme in Environmental Engineering is grouped among the engineering sciences study programmes.

§ 2 Admission

Admission to the degree programme is granted by the Rectorate in accordance with the provisions of the Universities Act 2002 - UG on admission to bachelor's degree programmes.

§ 3 Qualification profile

- (1) Environmental engineering offers technical solutions for the sustainable design of our living spaces. The occupational field encompasses engineering approaches that are always considered in the context of the interaction between humans and the environment. Environmental engineers make significant contributions to ecologically sound solutions and the conservation of resources. Technical diligence, sustainability and economic efficiency are of particular importance. Their tasks include the planning, design, construction, calculation and realisation as well as the operation of projects.
- (2) Graduates of the degree programme have a technical and scientific understanding with a strong interdisciplinary focus, taking into account sustainable interactions between humans and the environment. Graduates have scientific and mathematical competences in subjects such as biology, chemistry, mathematics and computer science. These are supplemented by engineering approaches such as construction management, soil mechanics, engineering geology, thermo- and fluid mechanics, building physics, materials technology, metrology, surveying, geo-information systems and law. This enables graduates to demonstrate a broad understanding of technical and ecological issues. Graduates are prepared for specific requirements in environmental engineering, in particular through interdisciplinary content from various fields such as energy-efficient and sustainable construction, environmental geotechnics, hydraulic engineering and hydropower, water infrastructure and water resource management, waste and resource management, ecology and environmental economics, transport and infrastructure planning, environmental impact assessment (EIA) and certification. The theoretical approaches are covered by a scientific degree programme that includes the core areas of mathematics, technical mechanics, hydraulics, thermodynamics, building physics and materials science.
- (3) The graduates have competences in:
 1. Project structuring and explanation: They are able to carry out the planning and structuring of projects in the field of environmental engineering.
 2. Abstraction and modelling: They have the ability to make abstract interpretations of technical and engineering challenges and to create models for calculations.
 3. Analytical and numerical problem solving: They have problem-solving skills for complex problems and are able to critically interpret and evaluate data.
 4. Teamwork and communication: The degree programme promotes social skills, which are particularly in demand at the interfaces between different subject areas. A mixture of different teaching methods and the opportunity for interdisciplinary Bachelor's Theses promotes both independent and team-oriented work as well as networked thinking. Tutorials and tutorial programmes in groups promote the ability to work in a team. The graduates have thus learnt to know and apply these methods.
 5. Documentation and presentation: They are able to present technical content in a structured and target group-orientated manner, e.g. in (final) presentations. They can document the results of their calculations and work in a comprehensible manner.
- (4) A particular focus of the study programme is on climate protection and adaptation to the effects of climate change. Graduates are therefore able to apply methods for the development of climate-resilient structures and the use of sustainable materials and construction methods, particularly taking into account the challenges of the Alpine region. They are able to develop integrative concepts that meet the requirements of a changing environment.

- (5) The skills acquired during the degree programme provide graduates with a high degree of flexibility and adaptability to the dynamically developing job profiles in environmental engineering. They are well prepared for the challenges of engineering practice as well as for a further master's programme and can actively and successfully shape their professional future. Graduates of the Bachelor's Programme in Environmental Engineering at the University of Innsbruck thus contribute to the sustainable development of our living spaces and are excellently prepared for various career paths in engineering or related environmental fields.

§ 4 Scope and duration

The Bachelor's Programme in Environmental Engineering covers 180 ECTS-Credits. This corresponds to a duration of the study programme of six semesters. One ECTS-Credit corresponds to a workload of 25 hours.

§ 5 Types of courses and maximum number of students per course

- (1) Courses without continuous performance assessment:
Lectures (VO) are courses held in lecture format. They introduce the research areas, methods and schools of thought for a given subject. No maximum number of students per course.
- (2) Courses with continuous performance assessment:
1. Excursions (EX) conducted outside the premises of the university, serve to demonstrate and deepen course contents. Maximum number of participants: 25.
 2. Seminars (SE) provide in-depth study of contents, methods and techniques of a specialist area including presentations and discussions. Maximum number of students: 30; Seminar with Bachelor's Thesis: 15.
 3. Tutorials (UE) focus on the practical treatment of concrete scientific tasks within an area. Maximum number of participants: 30, for laboratory and equipment tutorials: 15.
 4. Lecture-tutorials (VU) focus on the practical treatment of concrete scientific tasks that are discussed during the lecture parts of the course. Maximum number of participants for the tutorial part: 30, for laboratory and equipment tutorials: 15.

§ 6 Allocation of places in courses with a limited number of participants

In courses with a limited number of participants, course places are allocated as follows:

1. Students of the Bachelor's Programme in Civil Engineering and Environmental Engineering are to be given priority.
2. Students for whom the study duration would be extended due to the postponement are to be given priority.
3. If the criteria in no. 1 and 2 do not suffice, first, students for whom this course is part of a compulsory module are to be given priority, and second, students for whom this course is part of an elective module.
4. If the criteria from no. 1 to no. 3 do not suffice, the available places are randomly allocated.

§ 7 Studies Induction and Orientation Stage

- (1) Within the scope of the Studies Induction and Orientation Stage, which takes place in the first semester, the following course examinations are to be passed:
1. Introduction to Environmental Engineering (VO 1, 1.5 ECTS-Credits),
 2. Ecology and Sustainable Land Use (VO 2, 2.5 ECTS-Credits),
 3. Mathematics 1 (VO 4, 5.0 ECTS-Credits).
- (2) Positive evaluation of all exams in the Studies Induction and Orientation Stage entitles to passing all further courses and exams as well as to writing the Bachelor's Thesis in consideration of the respective prerequisites.

- (3) Before the completion of the Studies Induction and Orientation Stage, courses covering 21 ECTS-Credits may be passed from the entire programme of the study programme, except Compulsory Module 24 (Seminar with Bachelor's Thesis).

§ 8 Compulsory and elective modules

- (1) Compulsory modules covering 150 ECTS-Credits are to be passed.

1.	Compulsory Module: Mathematics 1	h	ECTS-Credits
a.	VO Mathematics 1	4	5
b.	UE Mathematics 1	2	2.5
	Total	6	7.5
<p>Learning Outcomes: Ad a and b: Students are able to explain and apply fundamental topics in mathematics for an engineering study programme (linear algebra, differential and integral calculus). They are qualified to use this knowledge to solve practical problems.</p>			
<p>Prerequisite/s: none</p>			

2.	Compulsory Module: Mechanics 1 and Programming	h	ECTS-Credits
a.	VO Mechanics 1	1	2
b.	UE Mechanics 1	1	1.5
c.	VO Programming Language	1	1.5
d.	UE Programming Language	2	2.5
	Total	5	7.5
<p>Learning Outcomes: Ad a and b: Students can describe the principles of mechanical modelling and classify forces. They are able to reduce groups of forces, set up equilibrium conditions and calculate the centre of forces (centre of gravity). They can judge whether a planar or spatial mechanical system consisting of rigid bodies is supported in a statically determinate manner and can formulate equilibrium conditions for calculating the support reactions. They are able to apply the principle of section and describe the mechanical relationships for the uniaxial and plane stress state. They are able to determine the internal forces from the internal forces of beams. They are able to calculate the internal forces for statically determinate planar and spatial beam structures and check the relationship between internal forces and external forces with the help of local equilibrium conditions. They are able to apply the mechanics tasks dealt with to suitable model problems and derive the underlying theories and equations. Ad c and d: Students can solve mathematical and engineering problems in a programming language, present data and calculation results in comprehensible graphics and develop user-friendly user interfaces for calculation programmes.</p>			
<p>Prerequisite/s: none</p>			

3.	Compulsory Module: Orientation and Construction Operations	h	ECTS-Credits
a.	VO Introduction to Environmental Engineering	1	1.5
b.	VU Fundamentals of Sustainability and Climate Responsibility in Construction Projects	2	2.5
c.	VO Construction Engineering and Economics 1	2	2.5
	Total	5	6.5
<p>Learning Outcomes: Ad a: Students are able to describe the main contents of the study programme in environmental engineering and the main methodological approaches of the subject area. They can explain the potential contribution of environmental engineering to current social challenges and name career profiles of graduates. They can also explain the principles of good scientific practice and utilise their rights and obligations in accordance with study law. Ad b: Students are able to explain the mechanisms and future scenarios of climate change, name the EU-wide and Austrian climate targets and identify their implementation in corresponding regulations relating to the construction industry. They can implement energy-efficient, cost-effective and climate-resilient construction, choose fossil-free energy supplies for heating, ventilation and air conditioning and evaluate building materials and constructions in terms of the circular economy. Ad c: Students are able to name and describe the basic principles of construction operations (construction equipment, construction methods and construction processes), describe the various phases of a construction project and their typical processes, and identify the relationships between the individual spheres of the construction industry (client and contractor). They are able to explain the basic principles of tendering and awarding contracts, cost calculation and pricing as well as construction contracts and discuss construction management and construction industry topics.</p>			
Prerequisite/s: none			

4.	Compulsory Module: Biology, Ecology and Landscape Utilisation	h	ECTS-Credits
a.	VO Biology for Environmental Engineering	2	2.5
b.	VO Ecology and Sustainable Land Use	2	2.5
	Total	4	5
<p>Learning Outcomes: Ad a: Students can list the basic structures and functions in aquatic ecosystems. They are able to describe the diversity of microorganisms and their feeding behaviour and can explain their benefits in wastewater and waste treatment. They are able to describe the biogeochemical cycles and ecological processes and explain the importance of microorganisms in these. Ad b: Students are able to define and explain the basic concepts of ecosystems, nutrient cycles and water balances. They can explain climate models and scenarios and describe the potential effects of climate change on various ecosystems and landscapes. Students are able to assess the consequences of soil sealing and develop water-sensitive urban planning approaches. They are able to explain the different categories of land use and the principles of spatial planning policy as well as classify planning instruments such as zoning and development plans, local development concepts and supra-local spatial planning programmes. Furthermore, they are able to critically reflect on the historical influence of human activities on the landscape.</p>			
Prerequisite/s: none			

5.	Compulsory Module: Mathematics 2	h	ECTS-Credits
a.	VO Mathematics 2	2	2.5
b.	UE Mathematics 2	2	2.5
c.	VU Probability Theory and Statistics	2	2.5
	Total	6	7.5
<p>Learning Outcomes: Ad a and b: Students are able to explain and apply further fundamental topics in mathematics for an engineering degree programme (curves and surfaces, integral theorems, differential equations). They are qualified to use this knowledge to solve practical problems. Ad c: Students are able to explain descriptive and inferential statistics and apply them to practical problems.</p>			
Prerequisite/s: none			

6.	Compulsory Module: Mechanics for Environmental Engineering, Applied Geometry and CAD	h	ECTS-Credits
a.	VO Mechanics for Environmental Engineering	2	2.5
b.	UE Mechanics for Environmental Engineering	1	1.5
c.	VO Applied Geometry and CAD	2	2.5
d.	UE Applied Geometry and CAD	2	2.5
	Total	7	9
<p>Learning Outcomes: Ad a and b: Students are able to calculate the member forces of plane statically determinate trusses. They can reduce the pressure field of liquids at rest on flat and circularly cylindrically curved tank walls and determine the hydrostatic buoyancy. They can describe and calculate the elongation and distortion of deformable bodies using the slender tension rod. They can apply the linear spring law and the relationship between normal stress and normal strain. They are able to determine the speed and acceleration of point-shaped bodies. They are able to describe the kinematics of flowing fluids in Lagrangian and Eulerian form and apply the law of conservation of mass to stationary control volumes through which a flow passes. Students can apply the centre of gravity theorem to set up the equation of motion of systems with one degree of freedom. They can transfer suitable mechanical systems into the model of the single-mass oscillator, which includes the equivalent spring stiffness of statically determined rods, which is calculated using the deflection (here using Mohr's method). They can calculate the natural angular frequency of the single-mass oscillator and judge whether a force-excited single-mass oscillator oscillates in resonance. They are able to apply Coulomb's law of friction. They are able to determine the mechanical work, power and potential energy for individual forces, line loads, weight forces and spring forces. They can explain the power theorem, work theorem and energy theorem and apply them to systems of point-shaped bodies. They are able to use the Bernoulli equation to determine the relationship between the pressure and velocity of ideal fluids and calculate the resulting force effect on boundary surfaces using the momentum and swirl theorem for control volumes. They can apply the problems dealt with in the mechanics of solid and liquid bodies to suitable model problems and derive the underlying theories and equations. Ad c and d: Students are able to select and use methods for the representation of three-dimensional objects on a two-dimensional drawing medium in a professional manner. They are able to describe and analyse technical-geometric relationships using appropriate projections and geometric terms. They can use geometric constructions, both manually and on the computer, for visualisation and problem-solving purposes.</p>			

Prerequisite/s: none

7.	Compulsory Module: Law, Economy and Taxonomy	h	ECTS-Credits
a.	VO Legal Bases for Construction Projects	2	2.5
b.	VU Economy and Taxonomy	2	2.5
	Total	4	5
<p>Learning Outcomes: Ad a: Students acquire the knowledge required for the implementation of construction contracts in the areas of general administrative procedure law, the parties to the procedure, the structure of the authorities and instances, the land register, building regulations, regional planning, public procurement law, water law, road law, railway law, traffic law, forestry law, nature conservation law and environmental impact assessment (EIA) and can explain the relevance for construction projects. Ad b: Students can name the environmental objectives of the EU taxonomy and recognise their implementation in construction projects. They are able to name the interactions between economic principles and taxonomic aspects in construction projects and apply methods for analysing the ecological and economic effects of construction projects. They are able to evaluate construction projects taking into account ecological sustainability and economic efficiency and incorporate this into long-term planning decisions and project design.</p>			
Prerequisite/s: none			

8.	Compulsory Module: Traffic Planning	h	ECTS-Credits
a.	VO Traffic Planning	2	2.5
b.	UE Traffic Planning	2	2.5
	Total	4	5
<p>Learning Outcomes: Ad a and b: Students can describe and argue the relationships between mobility, traffic, traffic supply and settlement structure, explain the development and characteristics of the individual types of traffic and derive and list the resulting planning principles, name and discuss the function, consequences and effects of traffic and derive and explain the basic strategies of traffic planning, explain the most important methods of traffic and mobility surveys and approaches to traffic modelling, explain and use the basics and correlations of traffic flow, performance and dimensioning of road routes and junctions, calculate traffic signal programmes, describe the basics of traffic management and provide an overview of traffic management systems. In addition, students are able to apply the basics of mobility surveys and analysis and determine mobility indicators, carry out, evaluate and analyse various basic traffic surveys, carry out a deficiency analysis from the perspective of all traffic types and derive and justify improvement measures, present the existing situation and a redesign in plans and views, summarise the work in a report and present the main results.</p>			
Prerequisite/s: none			

9.	Compulsory Module: Surveying and Road Infrastructure	h	ECTS-Credits
a.	VO Surveying	2	2.5
b.	UE Surveying Calculations	1	1.5
c.	VO Road Infrastructure	2	2.5
d.	UE Road Infrastructure	1	1.5
	Total	6	8
<p>Learning Outcomes: Ad a and b: Students can explain the role of surveying in civil engineering, identify surveying instruments and explain how they work. Students can solve basic trigonometric tasks, apply the first and second main geodetic tasks and carry out area calculations. They can interpret geodetic calculations and use error propagation to estimate the effect of measurement errors. They are able to use different coordinate systems and organise planning bases. They can import and export data and measurement data in standard software and list important data formats. They are able to design survey plans. Ad c and d: Students are able to give an overview of road infrastructure and describe road project planning, explain the influence of vehicle characteristics and driving dynamics on road design, describe the elements of road alignment in open country (including rural roads) and the design of junctions and inner-city roads, explain the design of infrastructure for pedestrians and cyclists, describe facilities for stationary traffic and their design elements, explain the principles and methods of benefit-cost analysis, and describe the basics of road construction, equipment and maintenance. They are able to apply the basic principles of road design and use them to create the route of a road, draw up corresponding plans (site plan, longitudinal section, cross-sections) and summarise the work in a technical report.</p>			
Prerequisite/s: none			

10.	Compulsory Module: Hydraulics, Hydrology and Engineering Geology	h	ECTS-Credits
a.	VU Hydraulics	2	2.5
b.	VU Hydrology and Water Management	2	2.5
c.	VO Engineering Geology	2	2.5
	Total	6	7.5
<p>Learning Outcomes: Ad a: Students can name the fluid properties relevant to hydraulic engineering. They can describe the theoretical principles of hydrostatics and hydrodynamics with regard to the application of hydraulic engineering issues and name fundamental terms and calculation approaches in connection with pipe flows and discharges in open channels. They can apply empirical calculation approaches developed for this purpose and use them to independently solve hydraulic engineering (hydraulic) problems. Ad b: Students can name and describe the essential components of the local water cycle and name and describe the key processes involved in the formation of precipitation and runoff in alpine catchment areas; they can recognise the interrelationships and mutual interactions of these processes and assess the influence of anthropogenic changes; they can describe the most important methods and measuring instruments commonly used in practice for recording runoff parameters in water bodies, including for measuring flow depths, flow velocities and discharges; students can apply statistical methods to estimate the probability of occurrence of flood discharges. Ad c: Students can differentiate between minerals and rocks. They can explain geological processes and their influence on solid and loose rocks and assess the possibilities and</p>			

	limitations of geological-geotechnical investigations, subsurface models and forecasts. In addition, they can name the geological, hydrogeological and geotechnical significance of pore, fissure and karst groundwater and apply the necessary laboratory tests for soil naming and classification of soils and analyse the results.
	Prerequisite/s: none

11.	Compulsory Module: Building Physics	h	ECTS-Credits
a.	VO Building Physics	2	2.5
b.	UE Building Physics	2	2.5
	Total	4	5
Learning Outcomes: Ad a and b: Students are able to explain the methods for the standardised dimensioning of building components in terms of building physics and the calculation of a building's heating requirements and calculate complex examples from the specialist areas of thermal insulation, moisture protection and sound insulation. They can develop practical building solutions to improve the energy efficiency, comfort and durability of buildings.			
Prerequisite/s: none			

12.	Compulsory Module: Chemistry and Materials	h	ECTS-Credits
a.	VU Chemistry	2	2.5
b.	VO Building Materials 1	2	2.5
	Total	4	5
Learning Outcomes: Ad a: Students can use chemistry terminology/notation and recognise the information content of chemical reaction equations, apply the basics of stoichiometry and identify influences on reaction kinetics. They can explain the acid/base concept and use it to calculate pH values. They can apply the electrochemical voltage series and determine equilibrium positions in redox reactions. They can describe the chemical structure and origin of important substances in the environment and explain chemical properties and reactivity as well as their interaction/reactions with other substances and effects on ecological systems. Ad b: Students are able to explain basic experimental findings and atomic models. They can classify atomic bonds and describe molecular structures as well as identify the type of atomic bonds. They can explain the morphologies resulting from the atom/molecule arrangement and their influence on material properties. They can interpret experimental observations on mechanical/thermal behaviour and relate them to processes at the atomic/molecular level. They can present simple models to describe thermo-mechanical properties and solve simple tasks on thermo-mechanical material behaviour.			
Prerequisite/s: none			

13.	Compulsory Module: Surveying and Modelling	h	ECTS-Credits
a.	UE Surveying and Surveying in Practice	2	2.5
b.	VU Modelling and Simulation	2	2.5
	Total	4	5

	<p>Learning Outcomes: Ad a: Students can describe, distinguish and use various geodetic devices, draw up plans and compile reports. They are able to prepare and carry out simple surveying work. Ad b: Students are able to explain models and analysis methods relevant to an engineering degree programme and discuss uncertainties of the associated parameters. They are qualified to select and use relevant solution methods for practical problems.</p>
	Prerequisite/s: none

14.	Compulsory Module: Thermodynamics and Measuring Technology	h	ECTS-Credits
a.	VU Thermodynamics	2	2.5
b.	VU Measuring Technology	2	2.5
	Total	4	5
	<p>Learning Outcomes: Ad a: Students can explain the balance equations for mass, energy and entropy in technical thermodynamics. They can explain the 1st and 2nd laws of thermodynamics, enumerate the basics of heat transfer and explain state diagrams. They can explain how energy technology components such as heat exchangers, compressors and turbines work and calculate and evaluate the efficiency of components and systems. Ad b: Students can differentiate between different types of faults and describe the structure of the measurement chain. They are able to assess analogue and digital measurement methods and explain the electrical fundamentals of measurement technology and BUS systems. They are able to use various sensors in environmental technology and surveying and assess the measurement errors that occur.</p>		
	Prerequisite/s: none		

15.	Compulsory Module: Urban Water Management	h	ECTS-Credits
a.	VO Urban Water Management	2	2.5
b.	UE Urban Water Management	2	2.5
	Total	4	5
	<p>Learning Outcomes: Ad a und b: Students are able to define and describe basic concepts of water resources, water extraction, water treatment, wastewater and rainwater. They can determine basic information and carry out measurements. They are able to explain the principles of rainfall-runoff calculation and rainwater treatment and apply them to sustainable water management. Students are able to explain the role of water in urban areas and develop nature-based solutions for water supply and disposal. They are able to analyse the effects of climate change, especially droughts and heat waves, on urban water management and to evaluate and plan integrative, sustainable strategies for dealing with these challenges.</p>		
	Prerequisite/s: none		

16.	Compulsory Module: Materials for Environmental Engineering	h	ECTS-Credits
a.	VO Materials for Environmental Engineering	2	2.5
b.	UE Materials for Environmental Engineering	2	2.5
	Total	4	5

	<p>Learning Outcomes: Ad a and b: Students can describe the components, composition and manufacturing processes of materials and assess their resource requirements, the environmental impact of production and the problems of disposal. They can explain the relationship between the composition/structure, manufacturing process and recyclability of materials. They can interpret characteristic values of materials and describe methods for determining them. They can explain processes in materials and calculation approaches and solve simple examples. Students can describe methods for analysing materials with regard to their chemical/structural condition and for determining their physical properties. They are able to characterise the condition of a material from measurement data and record changes in materials. They can determine characteristic values and evaluate results with regard to their plausibility and validity. They are able to carry out selected analyses and prepare and interpret the results for external parties.</p>
	Prerequisite/s: none

17.	Compulsory Module: Rail Infrastructure	h	ECTS-Credits
a.	VO Rail Infrastructure	2	2.5
b.	UE Rail Infrastructure	2	2.5
	Total	4	5
	<p>Learning Outcomes: Ad a and b: Students are able to differentiate between the track-guided systems in the railway system, name the main environmentally relevant influencing parameters and critically evaluate these with regard to sustainability. They are able to explain the most important superstructure systems and dimension them for the respective application. They are able to reproduce interrelationships from a technical, economic and safety-relevant perspective. They are able to apply the principles of needs-based and environmentally friendly routing of railway lines. They are able to describe the procedures for determining the journey time and energy consumption of a train journey, assess the relevant influencing variables and calculate examples independently. They are able to apply the models for calculating load transfer in railway superstructures and analyse and evaluate their interrelationships. They are able to explain the options for effectively reducing noise and vibration emissions from railway operations and weigh up their advantages and disadvantages. With their knowledge of signalling and operations control technology, they are able to bring together the key structural and environmental aspects. They are able to explain the principles for the development of passenger and freight transport systems and to plan such systems.</p>		
	Prerequisite/s: none		

18.	Compulsory Module: Geoinformation Systems and Fluvial Processes	h	ECTS-Credits
a.	VU Geoinformation Systems	2	2.5
b.	VU Fluvial Processes	2	2.5
	Total	4	5
	<p>Learning Outcomes: Ad a: Students can recognise and describe types of geographical information and use GIS software to solve simple geospatial data problems. They are able to identify raster and vector data, name advantages and disadvantages, and assess the usability of data for various applications. They can list and describe GIS algorithms, carry out network analyses and generate map products.</p>		

	Ad b: Students can name the different types of fluvial displacement processes in alpine waters and their characteristics, explain the theoretical and empirical foundations for the transport of solids in water bodies and name their areas of application and limitations and the uncertainties associated with the application of such calculation approaches. They can apply selected approaches and (computer) models for tasks relating to bedload transport in bodies of water and interpret the results obtained.
	Prerequisite/s: none

19.	Compulsory Module: Soil Mechanics for Environmental Engineering	h	ECTS-Credits
a.	VO Soil Mechanics for Environmental Engineering	2	2.5
b.	UE Soil Mechanics for Environmental Engineering	2	2.5
	Total	4	5
	Learning Outcomes: Ad a and b: Students can differentiate between the most important soil types, identify their decisive physical and mechanical properties and determine the characteristic values required for soil mechanical calculations. They can evaluate the results of the corresponding laboratory and field tests and decide which test provides the parameters required for the design. They can explain the difference between the stiffness and strength of soil and are able to model stationary and transient groundwater flows and estimate the spread of pollutants and temperature in groundwater. They can dimension wells and apply filter criteria. They can explain the models for describing the shear strength of soils based on forces and correctly select the associated parameters.		
	Prerequisite/s: none		

20.	Compulsory Module: Energy-Efficient Buildings and Building Services Engineering	h	ECTS-Credits
a.	VU Energy-Efficient Buildings	2	2.5
b.	VO Building Services Engineering	2	2.5
	Total	4	5
	Learning Outcomes: Ad a: Students can list and describe all the individual elements and the most important criteria of energy-efficient construction and illustrate them using examples. They apply the basic knowledge of building physics, in particular the energy balance, to the planning criteria of energy-efficient buildings. Using different component connections, they describe the principles of 'thermal bridge-free construction'. They justify the necessity of controlled ventilation with heat recovery, classify energy-efficient buildings for different climate zones and transfer the principles, components and individual solutions they have learnt to functional overall solutions. They evaluate and compare different solutions with regard to economic (dynamic profitability calculation), ecological (whole life carbon assessment), energy-related (heat demand, heat load) and practical construction criteria. They critically evaluate the normative limit values and simplified procedures from a scientific perspective. Students can independently apply the principles of energy-efficient construction to problems in new construction and refurbishment. Ad b: Students can explain the principles of heating, ventilation and air conditioning technology and explain their interaction with the building, the outdoor climate and comfort. They can analyse buildings with regard to the design of heating/ventilation and air conditioning. They are able to explain the functioning of heat output systems, heating hydraulics and their components as well as heat generators.		
	Prerequisite/s: none		

21.	Compulsory Module: Wastewater and Waste Management	h	ECTS-Credits
a.	VO Wastewater Treatment and Water Quality	2	2.5
b.	VO Waste Management	2	2.5
c.	UE Waste Management	2	2.5
	Total	6	7.5
<p>Learning Outcomes: Ad a: Students can explain the principles of wastewater treatment and explain physical, chemical and biological processes. They are able to differentiate and evaluate plant concepts and select suitable concepts and purification processes for specific requirements. They are able to plan and operate wastewater treatment plants, taking into account legal requirements, technical standards and environmental aspects. Students are able to explain sludge treatment processes and differentiate between various methods. Students are able to analyse the relationships between mixed water management, wastewater treatment and water quality and develop measures to improve water quality. Ad b and c: Students can explain the principles of the circular economy and define waste as a recyclable material. They can select and evaluate suitable treatment processes for the respective material flow. Students are able to explain and critically scrutinise the interrelationships and feasibility of recycling quotas. They know what contribution the circular economy can make to sustainable development and can develop corresponding concepts.</p>			
Prerequisite/s: none			

22.	Compulsory Module: Environmental Geoengineering, River Engineering and Hydropower	h	ECTS-Credits
a.	VO Environmental Geoengineering	2	2.5
b.	UE Environmental Geoengineering	1	1.5
c.	VO Hydropower	2	2.5
d.	VU River Engineering	2	2.5
	Total	7	9
<p>Learning Outcomes: Ad a and b: Students can describe typical ground improvement measures (compaction, icing, injections, grouting) and explain and apply the models for dimensioning. They can analyse the efficiency of thermally activated components in the ground and determine the parameters and characteristic values required for a calculation. They are able to explain the mechanical mode of action of the securing of terrain jumps and can compare suitable nature-based solutions. They can analyse measures to reduce the spread of pollutants and sealing and evaluate their effectiveness. Ad c: Students can describe the current challenges of the energy industry, including in connection with climate change aspects and the transformation to renewable forms of energy, and explain the role of hydropower. They can describe the economic effects associated with the construction of river dams and reservoirs as well as their influence on the flow regime and sediment continuum and, in this context, also describe the requirements and challenges of ecologically compatible hydropower utilisation. Ad d: Students can name the different types of rivers and the different forms of river courses and beds and describe the different types of fluvial displacement processes in alpine waters and their characteristics. They can name the main and typical river engineering measures (historical and current) and describe their impact on the river system. In addition, they can name the river engineering challenges in ensuring an appropriate flood protection status and simultaneously maintaining the natural state of the watercourses.</p>			

	Prerequisite/s: none
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23.	Compulsory Module: Project Management, Valorisation and Recycling	h	ECTS-Credits
a.	VO Project Management and Interdisciplinary Planning	2	2.5
b.	VO Valorisation and Recycling	2	2.5
	Total	4	5

<p>Learning Outcomes: Ad a: Students can name the basic principles of project management and project control and apply them to the planning, monitoring and control of construction projects. They can explain the five phases of a construction project (development, planning, preparation for execution, execution, completion) using performance and remuneration models and describe the tasks of a general planner for building construction and civil engineering. They are able to name and assess methods for optimising construction processes and for checking specifications and planning documents. They are able to describe the construction-related roles and tasks of project control, project management and local construction supervision in accordance with applicable law and assess these in terms of cost, schedule and quality monitoring as well as quality assurance, taking into account sustainability aspects and the methods of claim and anti-claim management. They are able to describe the interrelationships of integral planning processes and implement effective and efficient cost and schedule planning for construction projects along the project phases in accordance with current law and performance and remuneration models. They are able to analyse the challenges of interdisciplinary work and develop and implement effective communication and collaboration methods in order to work successfully and in an interdisciplinary way in teams using digital methods and to organise smooth communication and cooperation between all project participants. Ad b: Students can describe the life cycle of construction materials (in particular metals, bricks, concrete and asphalt) and explain the path from production and use to disposal or reuse and recycling. They can describe methods for analysing, classifying and processing demolition and excavation/excavation material and assess the possibilities, limitations and the required effort of these methods. They can explain the legal and normative framework conditions in the context of valorisation and recycling and apply this knowledge to selected issues. They can list common pollutants and contaminants and explain methods and approaches for their detection using suitable analytical methods. They can apply methods for determining the CO2 footprint and for carrying out life cycle analyses for building materials and building structures and evaluate the results obtained with regard to their sustainability.</p>			
Prerequisite/s: none			

24.	Compulsory Module: Seminar with Bachelor's Thesis	h	ECTS-Credits
a.	SE Seminar with Bachelor's Thesis	1	1+9
	Total	1	10

<p>Learning Outcomes: Students are able to complete an independent written paper on a limited topic from the field of environmental engineering that meets the requirements of good scientific practice. They can research relevant literature and discuss and analyse it on this basis. They are able to present and discuss the results of their work in front of their peers.</p>			
Prerequisite/s: positively passed Studies Induction and Orientation Stage and proof of study achievements of at least 90 ECTS-Credits from the modules 1 – 23.			

(2) One elective module covering a total of 30 ECTS-Credits is to be passed:

1.	Elective Module: Free Choice	h	ECTS-Credits
	<p>Courses covering 30 ECTS-Credits are to be selected:</p> <p>i) Depending on the availability of places from the interdisciplinary and additional programmes offered at the University of Innsbruck and the curricula of the bachelor's or diploma programmes established at the University of Innsbruck. It is recommended that students also complete courses in the field of gender studies, women's and gender research, such as gender aspects for technical sciences and natural sciences.</p> <p>Furthermore the following courses are recommended:</p> <p>ii.1) VU CAD Advanced Training Course (2 hrs, 1.5 ECTS-Credits)</p> <p>ii.2) VU Mathematics Advanced Training Course (2 hrs, 1.5 ECTS-Credits)</p> <p>ii.3) VU Mechanics Advanced Training Course (2 hrs, 1.5 ECTS-Credits)</p> <p>ii.4) EX Excursions (2 hrs, 2.5 ECTS-Credits)</p> <p>ii.5) SE Lab Course (2 hrs, 2.5 ECTS-Credits)</p> <p>ii.6) VU Climate Change and Climate Change Adaptation (2 hrs, 2.5 ECTS-Credits)</p> <p>ii.7) SE Interdisciplinary Project (1 h, 2.5 ECTS-Credits)</p> <p>ii.8) VU Remote Sensing and Photogrammetry (2 hrs, 2.5 ECTS-Credits)</p> <p>ii.9) VU Bio-Based Building Materials (2 hrs, 2.5 ECTS-Credits)</p> <p>ii.10) VU Energy Systems in the Context of the Energy Transition (2 hrs, 2.5 ECTS-Credits)</p>		30
	Total		30
<p>Learning Outcomes:</p> <p>Ad i: Students have additional and in-depth competences, skills and additional qualifications. They can establish the connections to their own specialist knowledge and are able to individualise and deepen their specialist profile by acquiring additional qualifications.</p> <p>Ad ii.1: Students are able to use a CAD system professionally and apply it constructively in technical contexts.</p> <p>Ad ii.2: Students can reproduce the basic knowledge of mathematics based on upper secondary level from a university point of view and solve practical problems on these topics.</p> <p>Ad ii.3: Students can describe the tasks of mechanics and its basic principles. They can solve kinematics problems involving rectilinear movements (e.g. laws of position/speed/time and free fall). They can reduce planar force groups from individual forces, set up and solve equilibrium conditions. They can select and apply suitable equilibrium conditions for the targeted determination of support forces and internal forces of plane statically determinate beams and trusses. Students are able to graphically represent the calculated internal forces.</p> <p>Ad ii.4: Through the excursion, students gain practical insights into real projects and their realisation and can link these experiences with the theoretical concepts of their training. They can remember technical, legal and organisational aspects relevant to practice. The excursion also enables students to exchange ideas with experts.</p> <p>Ad ii.5: Students can list essential laboratory techniques and carry out, analyse, document and interpret selected laboratory experiments. They can evaluate the results of the experiments on the basis of the underlying theoretical models.</p> <p>Ad ii.6: Students can explain the causes, drivers and effects of climate change as well as mitigation and adaptation measures. They are able to describe various climate models and emission scenarios and interpret their results. They can identify the main sources of greenhouse gas emissions and analyse the effects of climate change such as heavy rainfall, droughts, heat waves, floods and other natural hazards on humans and the environment. They are able to assess the necessity and potential of technical and other adaptation strategies, political measures to reduce emissions and scenarios for the energy transition at international, national and regional</p>			

	<p>level. Students are able to find relevant data sources on climate change and use them for scientific analyses.</p> <p>Ad ii.7: Students are able to analyse complex problems from different technical perspectives and thus develop innovative solutions. They are able to work in teams. They can integrate different methods and approaches and present their results in a clear and structured manner. They are able to assess the relevance of interdisciplinary approaches in practice.</p> <p>Ad ii.8: Students can describe the methods of earth observation; they can list and interpret the geometric and physical principles. They are able to produce 3D reconstructions from photos and can describe the automation in photogrammetry. They are able to compare the properties of different remote sensing sensors, explain satellite orbit parameters and assess the usability of remote sensing data. They can use the most important data sources and evaluate the quality of the data.</p> <p>Ad ii.9: Students are able to describe the composition and manufacturing processes of bio-based building materials (wood, natural fibres, biopolymers, composites) including the extraction of raw materials (cultivation, harvesting and processing). They can evaluate and classify the quality of bio-based source materials in terms of cascading utilisation and establish connections between the quality and possible applications. They can describe the specific properties of bio-based building materials and their recyclability/recyclability after their service life. They can describe the influences of changing environmental conditions such as temperature and humidity on material behaviour and explain experimental methods for their characterisation. They are able to assess the durability of these building materials with regard to thermal/chemical and biological attacks. They are able to carry out the experimental methods for assessing durability and list methods for improving the durability of bio-based building materials. They can explain the aspect of variability of material properties of bio-based raw materials and describe measures - in particular sorting, metrological recording/process monitoring - to reduce the given variability. They can explain the performance of common bio-based building materials and, based on this, evaluate their possible applications.</p> <p>Ad ii.10: Students are able to explain the physical relationships for energy, explain the historical and current significance of energy and assess the impact of fossil fuels on the interdependence of countries and the effects on climate change. They can read and analyse the energy balances of countries. They are able to assess the effects of climate change on society and thus justify the phasing out of fossil fuels. They are able to assess the potential of renewable energy sources and their respective applications. They can explain the respective boundary conditions of future energy scenarios and assess the coherence of the assumed potential of renewable energy sources, the reduction in energy demand, the use of renewable energy sources and the technologies used for this purpose.</p>
	<p>Prerequisite/s: Ad i) The prerequisites specified in the respective curricula are to be met; ad ii) none.</p>

Instead of the elective module acc. to §8 para. 2, a Minor for bachelor's programmes or the respective parts may be passed, provided that places are available. Minors are fixed modules from other disciplines covering 30 ECTS-Credits. They are announced in the University of Innsbruck Bulletin.

§ 9 Bachelor's Thesis

- (1) Within the scope of the Compulsory Module Seminar with Bachelor's Thesis, a Bachelor's Thesis covering 9 ECTS-Credits is to be written.
- (2) The Bachelor's Thesis must be submitted in written form and/or in the electronic form specified by the Director of Studies.

§ 10 Examination regulations

- (1) A module is completed by the positive evaluation of its courses.
- (2) The performance of modules is evaluated by course examinations. Course examinations serve as proof of the knowledge and skills imparted in an individual course, whereby
 1. in the case of courses without continuous performance evaluation, the evaluation is based on a single oral, written and/or practical exam at the end of the course. The course instructor has to announce the examination method before the start of the semester.
 2. in the case of courses with continuous performance evaluation, the evaluation is based on at least two written, oral and/or practical contributions of the participants. The course instructor has to announce the examination method and the evaluation criteria before the start of the semester.
- (3) Modules and courses from other study programmes are subject to the examination regulations of the curricula they are taken from.

§ 11 Academic degree

Graduates of the Bachelor's Programme in Environmental Engineering are awarded the academic degree "Bachelor of Science", abbreviated as "BSc".

§ 12 Coming into force

This curriculum comes into force on 1 October 2025.