

SSC-based Objective-Module Matrix

TC 03

Civil Engineering – Bachelor Degree

Instructions for Creating the Objectives Module Matrix

An objective-module matrix – also known as *learning outcome-course matrix* – makes it possible to classify a study programme in two ways:

1. A simple objective-module matrix compares the learning outcomes (objectives) aimed for with a study programme with the modules (courses) that contribute to achieving this profile.
2. An SSC-based objective-module matrix is a tool for comparing the learning outcomes (objectives) of a study programmes to the learning outcomes defined by the ASIIN Subject-Specific Criteria (SSC). This matrix thus makes it possible to show how the ASIIN SSC are fulfilled in the learning objectives and the individual modules of the degree program.

In a first step, this „mapping“ procedure helps to determine the extent to which learning outcomes of a degree programme reflect, supplement or deviate from the exemplary learning objectives of the SSC. The learning outcomes formulated in the SSC always represent the typical objectives of a degree programme in the specified subject area. Deviations from the SSC are possible depending on the profile and orientation of a degree programme and can be explained by the university. Depending on the degree of subject orientation, learning outcome formulations from different SSCs can also be combined.

The second step is to reflect on the extent to which each individual module or course of a degree programme serves to achieve one or more learning objectives our learning outcomes. The assigned overarching learning outcomes should then also be reflected in the respective module description or course syllabus. In other words, at degree program level it can be checked whether all learning objectives are covered by the assigned modules and at module level it can be checked whether the overarching learning objective at degree program level is reflected accordingly in the module objectives.

Please fill in the following matrix for the respective degree program. First, compare the learning outcomes of the degree program with the SSC. Then write down in which modules or courses the individual learning outcomes are implemented.

Note: Some of the SSC have been abbreviated to match the matrix below. For their full content, please refer to the Subject-Specific Criteria Document directly.

ASIIN Subject-Specific Criteria (SSC)	Learning Outcomes of the Study Programme	Corresponding Modules
Knowledge and Understanding Graduates have an understanding of		
Mathematical basics (e.g. vector algebra, linear systems of equations, analytical and descriptive geometry, differential and integral calculus, differential equations, ...)	Graduation Requirement 1: Engineering Knowledge: Ability to apply mathematics, natural sciences, engineering fundamentals, and professional knowledge to solve complex engineering problems in building engineering, roads and bridges, etc. 1.1 Possess and apply mathematical knowledge required for engineering work.	Advanced Mathematics B (1), Advanced Mathematics B (2), Linear Algebra B, Probability Theory and Mathematical Statistics C, Descriptive Geometry
Physical, and if applicable, chemical fundamentals in relation to civil engineering	Graduation Requirement 1: Engineering Knowledge 1.2 Possess and apply natural science knowledge required to solve engineering problems.	College Physics (Mechanics + Thermodynamics), College Physics Laboratory, Inorganic and Analytical Chemistry, Inorganic and Analytical Chemistry Laboratory

Basics specified to civil engineering in technical mechanics, engineering informatics, digital construction, building construction, building physics, science of construction materials, and in geodesy	Graduation Requirement 1: Engineering Knowledge 1.3 Ability to use engineering fundamentals to provide support for solving complex engineering problems. Graduation Requirement 5: Use of Modern Tools: Ability to develop, select, and use appropriate technologies, resources, modern engineering tools, and IT tools for complex engineering problems. 5.1 Ability to select and use appropriate technologies, resources, modern tools, IT, and professional software for complex problems.	Technical Mechanics: Theoretical Mechanics, Mechanics of Materials, Mechanics of Materials Laboratory, Structural Mechanics A, Structural Mechanics B, Fluid Mechanics, Fluid Mechanics Laboratory Engineering Informatics and Digital Construction: Fundamentals of Information Science and Artificial Intelligence, Computer Programming, Civil Engineering Drawing, Engineering Drawing, BIM Software Learning, Application of Architectural Structure Design Software, Application of Road and Bridge Software Building Construction: Introduction to Civil Engineering, Building Architecture, Building Architecture Course Design Construction Materials Science: Engineering Materials, Engineering Materials Laboratory Surveying: Engineering Surveying, Engineering Surveying Practical Training
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Interdisciplinary basics (e.g. economics, law, ecology, history of building)	Graduation Requirement 6: Engineering and Society: Capability to conduct reasonable analysis based on engineering background knowledge, evaluate the impact of professional practices and complex problem solutions on society, health, safety, law, and culture, understanding assumed responsibilities. 6.1 Understand technical standards, codes, intellectual property rights, industrial policies, and laws/regulations related to civil engineering. Graduation Requirement 7: Environment and Sustainable Development: Ability to understand and evaluate the impact of engineering practices addressing complex civil engineering problems on society, environment, economy, and sustainable development. 7.1 Recognize and understand the impact of civil engineering project implementation on the environment and social sustainable development.	Engineering Ethics, Engineering Environmental Science, Engineering Economics, Construction Regulations, Green Building and Sustainable Development
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Constructional basics e.g. in structural analysis and structural design, solid construction, steel construction, timber construction and geotechnics	Graduation Requirement 1: Engineering Knowledge 1.4 Ability to use civil engineering professional knowledge to solve complex engineering problems in building, road, and bridge engineering. Graduation Requirement 3: Design/Develop Solutions: Ability to propose engineering design and construction solutions for complex civil engineering problems, design structural systems and construction methods meeting specific needs, reflecting innovation awareness and considering social, economic, legal, normative, and environmental factors. 3.1 Master basic methods of civil engineering design and construction; able to obtain effective information, analyze, and propose systematic solutions for complex problems.	Structural Analysis and Design: Engineering Load and Structural Design Methods, Structural Mechanics A Concrete Structures: ★ Principles of Concrete Structure Design, ★ Concrete Structure Design, Concrete Structure Design Course Design Steel Structures: ★ Principles of Steel Structure Design, ★ Steel Structure Design, Steel Structure Course Design Geotechnical Engineering: Soil Mechanics, Soil Mechanics Laboratory, Engineering Geology and Hydrogeology, Engineering Geology and Hydrogeology Practical Training, Foundation Engineering, Foundation Engineering Course Design, Foundation Pit Support
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The basics of water engineering, e.g. in water resource management, hydraulics engineering, or in urban water management	Graduation Requirement 1: Engineering Knowledge 1.4 Ability to use civil engineering professional knowledge to solve complex engineering problems in building, road, and bridge engineering. Graduation Requirement 4: Research: Ability to conduct research on complex civil engineering problems based on scientific principles and methods, propose reasonable research plans, analyze and interpret data, and derive valid conclusions through information synthesis. 4.1 Master basic scientific research methods and basic experimental skills, and perform reasonable data analysis and processing.	Fluid Mechanics, Fluid Mechanics Laboratory, Engineering Geology and Hydrogeology, Engineering Geology and Hydrogeology Practical Training, Hydrology of Bridge and Culvert
The basics of traffic engineering, e.g. in transport planning, in public transport systems or in road engineering	Graduation Requirement 1: Engineering Knowledge 1.4 Ability to use civil engineering professional knowledge to solve complex engineering problems in building, road, and bridge engineering. Graduation Requirement 3: Design/Develop Solutions 3.1 Master basic methods of civil engineering design and construction.	★ Road Survey and Design, Road Survey Course Design, ★ Roadbed and Pavement Engineering, Roadbed and Pavement Engineering Course Design, ★ Tunnel Engineering, ★ Bridge Engineering, Bridge Engineering Course Design

The basics of construction management, e.g. in construction project management, in construction process management, in construction business management or in construction planning management	Graduation Requirement 11: Project Management: Understand engineering project management principles and basic economic decision-making methods, applying them to multidisciplinary civil engineering practices. 11.1 Understand the importance of project management; apply economic analysis and decision-making methods to practice.	★ Civil Engineering Construction Technology and Organization, Civil Engineering Construction Technology and Organization Course Design, Engineering Project Management, Engineering Supervision Theory, Building Engineering Measurement and Valuation, Building Engineering Measurement and Valuation Course Design, Highway Engineering Measurement and Valuation, Highway Engineering Measurement and Valuation Course Design, Construction Drawing Interpretation
Research, Analysis, Evaluation, Method, Application Graduates are able to apply the acquired knowledge and understanding to activities or professions and to develop or improve solutions to problems in their field of specialisation.		
In structural engineering, graduates can		

assess and design load-bearing structures of different materials and calculate determinate and indeterminate load-bearing structures	Graduation Requirement 3: Design/Develop Solutions 3.1 Master basic methods of civil engineering design and construction; able to obtain effective information, analyze, and propose systematic solutions for complex problems. 3.2 Ability to determine design schemes and construction management models for specific needs; use drawings and calculation books to express design outcomes.	Structural Mechanics A, ★ Principles of Concrete Structure Design, ★ Principles of Steel Structure Design
design, construct and calculate solid and steel components as well as timber structures and to assess and ensure the load-bearing behaviour of components made of different materials as well as to limit deformations,	Graduation Requirement 3: Design/Develop Solutions 3.2 Ability to determine design schemes and construction management models for specific needs; use drawings and calculation books to express design outcomes; demonstrate design rationality and innovation.	★ Concrete Structure Design, Concrete Structure Design Course Design, ★ Steel Structure Design, Steel Structure Course Design, ★ High-rise Building Structure Design, ★ Seismic Design of Building Structures and Smart Disaster Prevention (Emerging Engineering Education), Seismic and Wind Resistance of Bridges
take into account the properties of the ground during planning and execution; design, plan and calculate geotechnical structures	Graduation Requirement 3: Design/Develop Solutions 3.1 Master basic methods of civil engineering design and construction. 3.3 Ability to comprehensively consider social, economic, legal, normative, and environmental safety factors in the design process.	Soil Mechanics, Soil Mechanics Laboratory, Foundation Engineering, Foundation Engineering Course Design, Foundation Pit Support, Engineering Structure Testing, Engineering Structure Testing Practical Training, Structural Model Making
In water engineering , graduates can		

calculate water cycle, water balance, hydrometry and runoff dynamics and apply basics of water law, flood protection and flood risk management,	Graduation Requirement 4: Research 4.1 Master basic scientific research methods and basic experimental skills, and perform reasonable data analysis and processing. 4.2 Design scientific experimental plans using reasonable principles and skills based on professional knowledge; analyze data and interpret results.	Fluid Mechanics, Fluid Mechanics Laboratory, Engineering Geology and Hydrogeology, Engineering Geology and Hydrogeology Practical Training, Hydrology of Bridge and Culvert
design and dimension hydraulic engineering measures and to deal with hydraulic problems,	Graduation Requirement 4: Research 4.2 Design scientific experimental plans using reasonable principles and skills based on professional knowledge; analyze data and interpret results. 4.3 Understand key scientific issues; explain experimental phenomena and derive effective conclusions based on civil engineering principles.	Fluid Mechanics, Fluid Mechanics Laboratory
understand the tasks and procedures of urban water management as a basis for environmental engineering and to participate in the planning, construction, operation and maintenance of water supply and wastewater engineering facilities	Graduation Requirement 4: Research 4.3 Understand key scientific issues; explain experimental phenomena and derive effective conclusions based on civil engineering principles.	Engineering Geology and Hydrogeology, Engineering Geology and Hydrogeology Practical Training
In traffic engineering , graduates can		

participate in urban and regional planning and develop planning goals in an interdisciplinary context	Graduation Requirement 3: Design/Develop Solutions 3.3 Ability to comprehensively consider social, economic, legal, normative, and environmental safety factors in the design process.	★ Road Survey and Design, Road Survey Course Design
develop problem analyses and solution concepts in transport planning, including the planning of public transport systems and the design, construction and operation of road and rail routes and to develop infrastructure measures in road and rail transport	Graduation Requirement 3: Design/Develop Solutions 3.1 Master basic methods of civil engineering design and construction. 3.2 Ability to determine design schemes and construction management models for specific needs.	★ Road Survey and Design, ★ Roadbed and Pavement Engineering, Roadbed and Pavement Engineering Course Design, ★ Tunnel Engineering, ★ Bridge Engineering, Bridge Engineering Course Design
develop traffic control systems	Graduation Requirement 5: Use of Modern Tools: Ability to develop, select, and use appropriate technologies, resources, modern engineering tools, and IT tools, including prediction and simulation, understanding their limitations. 5.1 Ability to select and use appropriate technologies, resources, modern tools, IT, and professional software for complex problems.	Application of Road and Bridge Software, Smart Bridges (Emerging Engineering Education), New Concepts in Highway Survey and Design
In construction management , graduates can		

plan and implement construction projects contractually and economically and prepare a quotation costing	Graduation Requirement 11: Project Management 11.2 Ability to carry out preliminary engineering design using engineering knowledge from multidisciplinary perspectives (engineering, management, economics).	★ Civil Engineering Construction Technology and Organization, Civil Engineering Construction Technology and Organization Course Design, Building Engineering Measurement and Valuation, Building Engineering Measurement and Valuation Course Design, Highway Engineering Measurement and Valuation, Highway Engineering Measurement and Valuation Course Design
recognise deviations and disruptions in the construction process to initiate countermeasures and recognise changes in performance	Graduation Requirement 11: Project Management 11.1 Understand the importance of project management; apply economic analysis and decision-making methods to practice.	★ Civil Engineering Construction Technology and Organization, Civil Engineering Construction Technology and Organization Course Design, Engineering Supervision Theory, Engineering Project Management
prepare project documents for cost planning as well as for the determination of area and volume, to draw up technical terms of a contract, to participate in the drafting of planning and construction contracts	Graduation Requirement 11: Project Management 11.1 Understand the importance of project management; apply economic analysis and decision-making methods to practice. Graduation Requirement 6: Engineering and Society 6.1 Understand technical standards, codes, intellectual property rights, industrial policies, and laws/regulations related to civil engineering.	Construction Regulations, Engineering Economics, Construction Drawing Interpretation, Prefabricated Building Construction Technology, Smart Construction (Emerging Engineering Education)

Independent of their area of specification, graduates can		
use information technology tools independently for various tasks and critically analyse computer results of simple control calculations	Graduation Requirement 5: Use of Modern Tools 5.1 Ability to select and use appropriate technologies, resources, modern tools, IT, and professional software for complex problems. 5.2 Ability to use modern tools to analyze, calculate, and design; simulate and predict technical indicators affecting performance, understanding model limitations.	Fundamentals of Information Science and Artificial Intelligence, Computer Programming, BIM Software Learning, Application of Architectural Structure Design Software, Application of Road and Bridge Software

use classical and modern research methods to identify, interpret and integrate technical literature and data sets	Graduation Requirement 2: Problem Analysis: Capability to identify, express, and solve complex engineering problems in civil engineering using basic principles of mathematics, natural sciences, and engineering sciences to obtain effective conclusions. 2.3 Ability to analyze complex civil engineering problems through literature research, and use mathematics, natural sciences, and engineering sciences for reasoning and verification to obtain effective conclusions. Graduation Requirement 4: Research 4.1 Master basic scientific research methods and basic experimental skills, and perform reasonable data analysis and processing. 4.2 Design scientific experimental plans using reasonable principles and skills based on professional knowledge; analyze data and interpret results. 4.3 Understand key scientific issues; explain experimental phenomena and derive effective conclusions based on civil engineering principles.	Professional English for Civil Engineering, Engineering Structure Testing, Engineering Structure Testing Practical Training, Smart Detection of Engineering Structures, Advanced Comprehensive Knowledge of Civil and Hydraulic Engineering, Structural Model Making, Graduation Project (Thesis)
Practical Skills, Personal and Social Skills, Scientific Aptitudes Graduates can		

Work effectively in teams of different compositions and organise teams	Graduation Requirement 9: Individual and Team: Possess a good team spirit; ability to take on roles as individuals, team members, and leaders in multidisciplinary teams when addressing complex civil engineering problems. 9.1 Accurately grasp one's role in a multidisciplinary team, fulfill duties, and proactively cooperate with other members. 9.2 Ability to organize and coordinate team members and coordinate relationships with personnel from other disciplines to jointly solve problems.	Ideological, Moral and Rule of Law, An Overview of Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era, Outline of Modern Chinese History, Basic Principles of Marxism, Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, Current Affairs and Policies, Introduction to the Community of the Chinese Nation, National Security Education, College Sports, Mental Health Education for College Students, Career Development and Employment & Entrepreneurship Guidance, Military Theory , Military Training, Labor, Thematic Practice of Core Socialist Values, Familiarization Internship, Production Internship, Graduation Internship, General Elective Courses (Comprehensive, Innovation & Entrepreneurship, Public Art, Sports & Health, Second Classroom)
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present and represent work results in front of expert and non-expert audiences	Graduation Requirement 10: Communication: Ability to effectively communicate and exchange views with industry peers and the public on complex problems, including writing reports, making presentations, and possessing an international perspective for cross-cultural communication. 10.1 Ability to effectively communicate with peers and the public, including writing project reports and design documents clearly. 10.2 Possess good civil engineering professional foreign language skills, understand international status, and communicate effectively cross-culturally.	College English, College Chinese, Professional English for Civil Engineering, Graduation Project (Thesis)
derive and define research questions, apply research methods, and present and explain research findings	Graduation Requirement 4: Research 4.1 Master basic scientific research methods and basic experimental skills, and perform reasonable data analysis and processing. 4.2 Design scientific experimental plans using reasonable principles and skills based on professional knowledge; analyze data and interpret results. 4.3 Understand key scientific issues; explain experimental phenomena and derive effective conclusions based on civil engineering principles.	Engineering Structure Testing, Engineering Structure Testing Practical Training, Structural Model Making, Smart Detection of Engineering Structures, Graduation Project (Thesis)