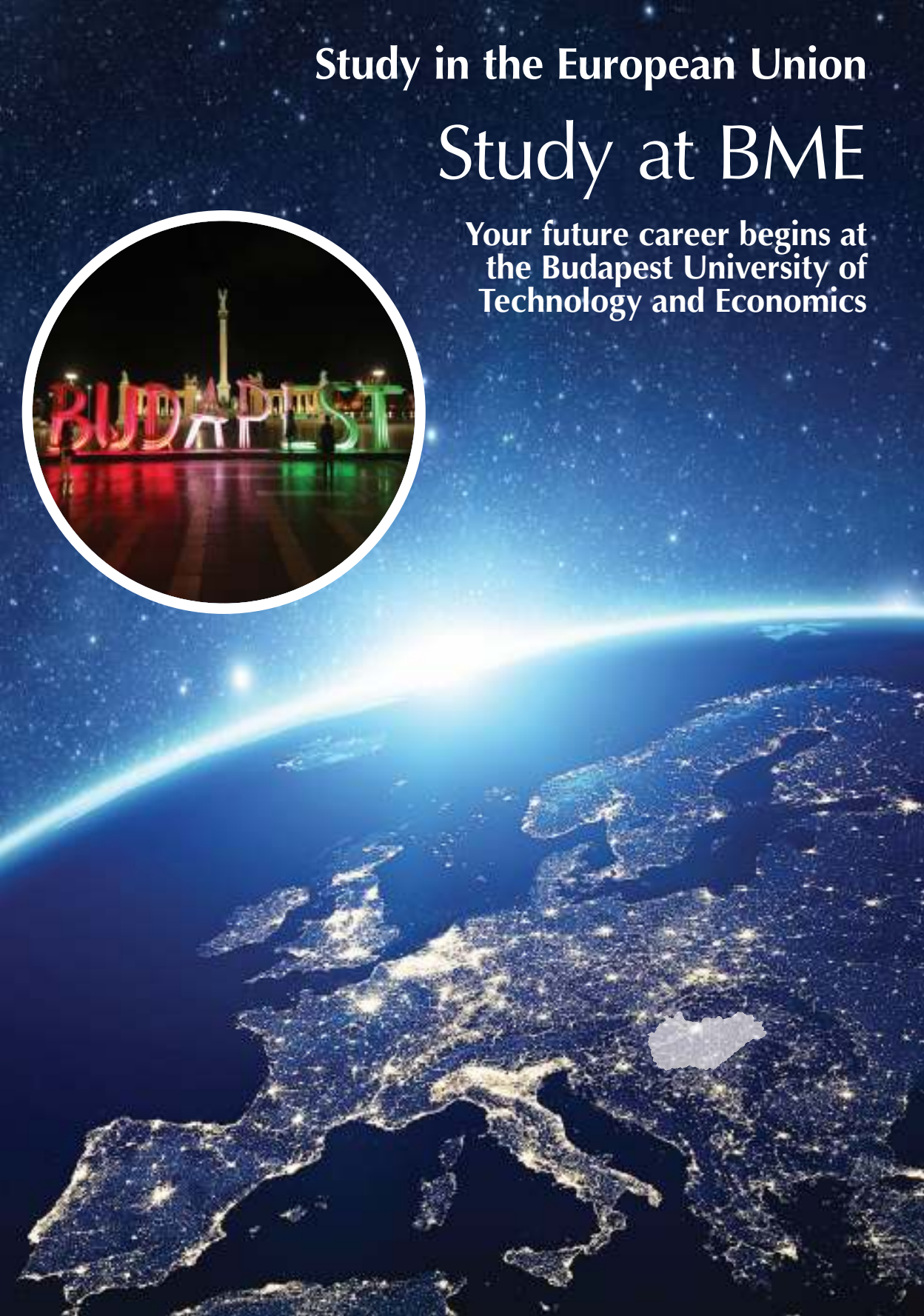Budapest University of Technology and Economics

BULLETIN
2020-2021

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BULLETIN

Budapest University of Technology and Economics

2020–2021

An ECTS Guide

MŰEGYETEM 1782

Programs in English
www.future.bme.hu
admission@mail.bme.hu

Dear Student,

You are reading the Bulletin of the Budapest University of Technology and Economics. Its direct predecessor, the Institutum Geometricum, was established in 1782 by Emperor Joseph II, as part of the Faculty of Liberal Arts at the University of Buda. During the past 237 years the professors of the university have striven to provide an outstanding quality of education. This has earned the university an international reputation, attracting students and also professors from all over the world.

Our university has eight faculties. They are, in order of foundation: Civil Engineering, Mechanical Engineering, Architecture, Chemical Technology and Biotechnology, Electrical Engineering and Informatics, Transportation Engineering and Vehicle Engineering, Natural Sciences, Economic and Social Sciences.

"Education is the most powerful weapon which you can use to change the world."
This is the quotation from Nelson Mandela. It is unquestionably true and especially applicable for engineers who have the power to make a better world:
Sustainable energy, clean water, safe transport on roads and on bridges, producing less pollution, buildings for comfortable living and working, machines and robots for work and for amusement, fast and reliable communications, medical equipment that assure a good quality of life for the individual and can be financed by society, and healthy food for us all. All of these goals need engineering solutions to make the world a safer, better and more exciting place to be. **This is also your responsibility.** You can acquire the necessary knowledge and skills to make your own contribution. As a graduate you will certainly do your best for your colleagues, company and society.

Two components are decisive for a good diploma: good teachers and a good student. I can say our university provides you with excellent teachers – **you must be good students!** I am sure it is worth being so.
Besides, you will love it: the university years will be your best memory, the engineering profession will provide you the joy of creation.
Hungary is a member of the European Union. As a student in Budapest you will find general European as well as particular Hungarian cultural customs: food, fashion, folk art, music and dance.

Use this bulletin to help you consider our programs. Come to visit our campus. Better yet, come to study with us for one or two semesters or for an entire degree program. Should you decide to stay for only one semester, this bulletin will also help you choose from among the different semester programs.

The Budapest University of Technology and Economics extends a special welcome to students from abroad.

Károly Veszprémi
vice-rector for education

Avaliable study programmes for 2020/2021 academic year

BSc programmes	Faculty
Chemical Engineering	Faculty of Chemical Technology and Biotechnology
Civil Engineering	Faculty of Civil Engineering
Computer Engineer	Faculty of Electrical Engineering and Informatics
Electrical Engineering	
Mathematics	Faculty of Natural Sciences
Mechanical Engineering	Faculty of Mechanical Engineering

MSc/MA* programmes	Faculty
Applied Mathematics	Faculty of Natural Sciences
Architecture (Five-year Integrated Master Program and Master in Architecture Program)	Faculty of Architecture
Chemical Engineering	Faculty of Chemical Technology and Biotechnology
Computer Engineer	Faculty of Electrical Engineering and Informatics
Electrical Engineering	
Environmental Engineering	Faculty of Chemical Technology and Biotechnology
Finance*	Faculty of Economic and Social Sciences
Management and Leadership*	
Regional and Environmental Economic Studies*	
Mechanical Engineering Modelling	Faculty of Mechanical Engineering
Physics	Faculty of Natural Sciences
Structural Engineering	Faculty of Civil Engineering
Autonomous Vehicle Control Engineering	Faculty of Transportation Engineering and Vehicle Engineering
Transportation Engineering	
Vehicle Engineering	
Logistics Engineering	

PhD programmes	Faculty
Architecture Engineering	Faculty of Architecture
Architecture (DLA program)	
Business and Management	Faculty of Economic and Social Sciences
Chemistry	Faculty of Chemical Technology and Biotechnology
Chemical- Bio- and Environmental Engineering	
Civil Engineering Sciences and Earth Sciences	Faculty of Civil Engineering
Computer Engineer	Faculty of Electrical Engineering and Informatics
Electrical Engineering	
Mathematics and Computer Science	Faculty of Natural Sciences
Physical Sciences	
Mechanical Engineering Science	Faculty of Mechanical Engineering
Autonomous Vehicle Control Engineering	Faculty of Transportation Engineering and Vehicle Engineering
Transportation Engineering	
Vehicle Engineering	
Logistics Engineering	

Tuition Fees for 2020/2021 academic year

Course	Faculty	For non-EU citizens EUR/ semester	For EU citizens EUR/ semester
Preparatory	Pre-engineering	3200	3200
Preparatory	General course	3200	3200
BSc	Faculty of Civil Engineering	3200	3200
	Faculty of Mechanical Engineering	3200	2250
	Faculty of Chemical Technology and Biotechnology		
	Faculty of Electrical Engineering and Informatics		
	Faculty of Natural Sciences		
MSc	Faculty of Civil Engineering	3800	3800
	Faculty of Architecture (10 semesters)	3200	2850
MSc for graduates of external higher education institutions	Faculty of Mechanical Engineering	3500	3200
	Faculty of Architecture (4 semesters)		
	Faculty of Chemical Technology and Biotechnology		
	Faculty of Electrical Engineering and Informatics		
	Faculty of Natural Science		
	Faculty of Transportation Engineering and Vehicle Engineering		
	Faculty of Economic and Social Sciences		
MSc for graduates of BME	Faculty of Mechanical Engineering	3200	2850
	Faculty of Chemical Technology and Biotechnology		
	Faculty of Electrical Engineering and Informatics		
	Faculty of Natural Science		
	Faculty of Transportation Engineering and Vehicle Engineering		
	Faculty of Economic and Social Sciences		
PhD*	Faculty of Civil Engineering	4500	4500
	Faculty of Mechanical Engineering		
	Faculty of Architecture		
	Faculty of Chemical Technology and Biotechnology		
	Faculty of Electrical Engineering and Informatics		
	Faculty of Natural Science		
	Faculty of Transportation Engineering and Vehicle Engineering		
	Faculty of Economic and Social Sciences		

+ Application fee: 100 EUR

* For PhD application please contact the faculties: http://www.bme.hu/faculties?language=en

The University Bank Account Number for payments of application (only bank transfer accepted)
Bank name: National Bank of Hungary (MNB)
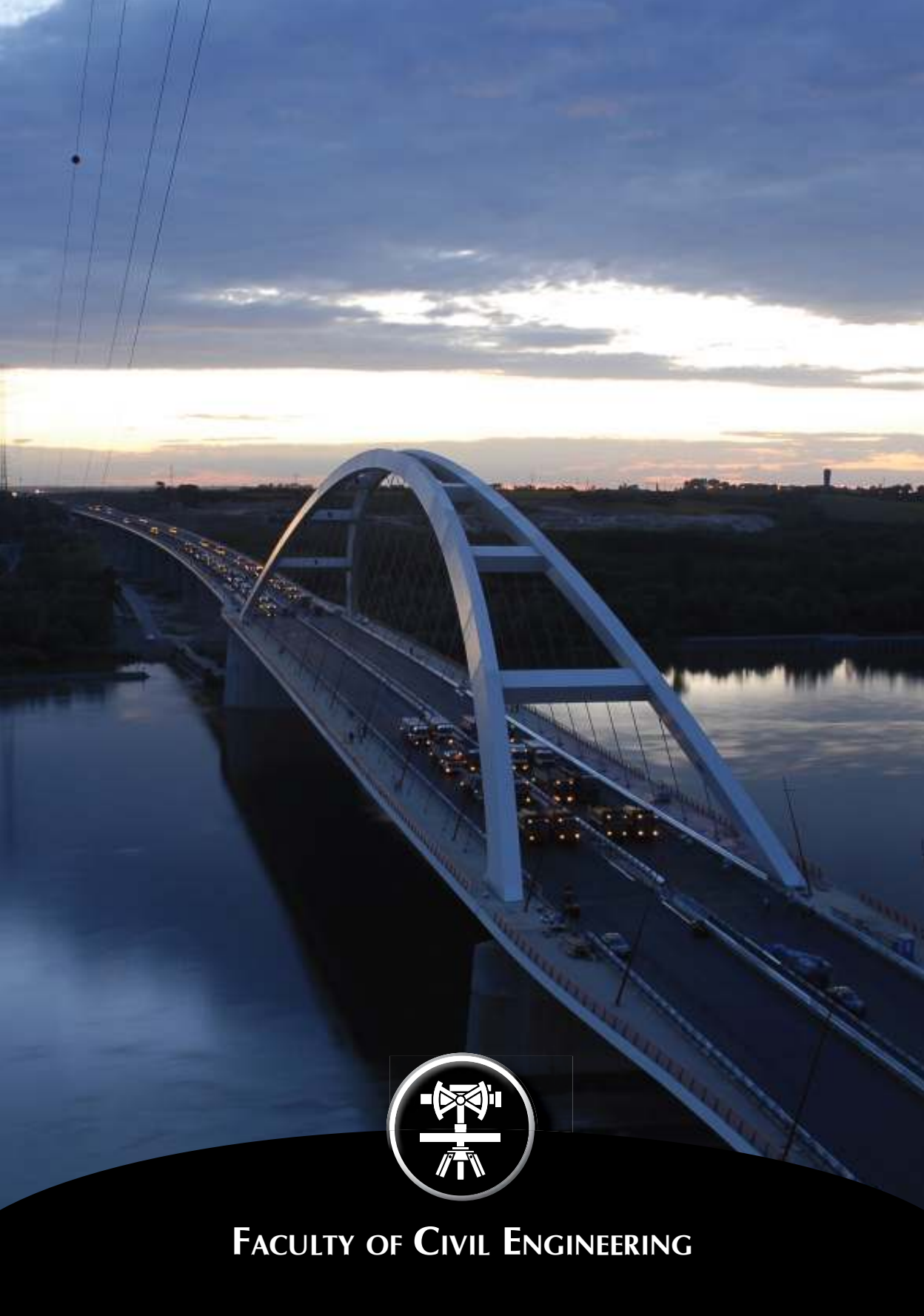Bank address: H-1850 Budapest, Szabadság tér 6-8., Hungary
Bank account number: 10032000-01425279-01110009
Swift code: MANEHUHB
IBAN code: HU22 1003-2000-0142-5279-0111-0009
Beneficiary name: BME
Beneficiary address: H-1111 Budapest, Műegyetem rkp. 3.,Hungary

FACULTY OF CIVIL ENGINEERING

The Faculty of Civil Engineering is the oldest faculty of the Budapest University of Technology and Economics and can trace its history back to the University's predecessor, the Institutum Geometricum, founded by Emperor Joseph II in 1782. Since then, thousands of engineers have graduated from this Faculty to work worldwide as educators, international researchers and engineering project managers.

The most essential service of the Faculty – education linked closely to research and engineering work – is reflected in the scientific activities of nearly 110 lecturers in 9 departments. They have contributed significantly to a professional, scientifically sound solution of diverse engineering problems.

The Budapest University of Technology and Economics has close relationships with Hungarian and foreign companies in the civil engineering fields, who are interested in the research and development of civil engineering structures and design methods. Out of the approximately 1200 students who study at this Faculty, 200 students from abroad participate in the English language program annually.

The BSc engineering program in English leads to a BSc degree in four years. Two specialisations are offered: Structural Engineering and Infrastructure Engineering. Graduates from the BSc Specialization in Structural Engineering are able to design, construct and organize the investments of mechanically, structurally and technologically complex structures in close cooperation with architects as well as transportation and hydraulic specialists. These structures include bridges and underground passages for transportation networks; power stations, cooling towers, craneways, transmission and telecommunication line structures; warehouses, industrial plants, and multi-storey buildings as well as hydraulic and water utility structures. Graduates from the BSc Specialization in Infrastructure Engineering are able to design and construct urban and regional infrastructure, such as roads, railways, water and wastewater utilities, hydraulic constructions, and organize engineering activities in these fields.

The Faculty offers an MSc programme in Structural Engineering with a duration of 1.5 years. The MSc programme has three specializations: Specialization in Numerical Modelling, Specialization in Structures, and Specialization in Geotechnics and Geology. Specialization in Numerical Modelling provides advanced knowledge of structural analysis using contemporary computer techniques, including the theoretical background of the methods. Specialization in Structures provides thorough knowledge in structural design, skills enabling to carry out independent project coordination and to execute special design, construction and development procedures. The main goal of the Specialization in Geotechnics and Geology is to provide enhanced knowledge and skills in the field of engineering geology, geotechnics modelling, underground structures and foundations. These specializations are useful for research oriented students pursuing a doctoral degree in a PhD programme, as well as for the next generation of practicing leading engineers, who will solve special structural problems and innovate the construction procedures.

The doctoral school of the Faculty offers a 4-year PhD programme in Civil Engineering and Earth Sciences.

Departments

Geodesy and Surveying
Construction Materials and Technologies
Photogrammetry and Geoinformatics
Engineering Geology and Geotechnics
Structural Engineering

Structural Mechanics
Highway and Railway Engineering
Hydraulic and Water Resources Engineering
Sanitary and Environmental Engineering

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Fax: (+36-1) 463-3530
Web: www.epito.bme.hu

Dean: Dr. László Dunai
Course-director: Dr. Olivér Fenyvesi
Program coordinator: Ms. Nóra Gáspár

Curriculum of BSc in Civil Engineering
Core subjects (8 semesters)

Subject			lecture/seminar/laboratory/exam								Preliminary require-ment(s)
Name	Code	Cre-dits	1	2	3	4	5	6	7	8	
Core subjects											
Compulsory English 1	BMEGT63A3E1	4	4/0/4/M								
Surveying 1	BMEEOAFAT41	3	3/1/2/M								
Chemistry of Construction Materials	BMEEOEMAT41	2	2/2/0/M								
Civil Engineering Representation and Drawing	BMEEOEMAT42	4	4/2/2/M								
CAD for Civil Engineers	BMEEOFTAT41	2	2/0/2/M								
Geology	BMEEOGMAT41	3	3/1/2/E								
Basis of Statics and Dynamics	BMEEOTMAT41	6	6/0/5/E								
Mathematics A1a - Calculus	BMETE90AX00	6	6/4/2/E								
Physics for Civil Engineers	BMETE11AX13	2	2/2/0/M								
Compulsory English 2	BMEGT63A3E2	4	4/0/4/M	4/0/4/M							
Surveying 2	BMEEOAFAT42	4		4/2/2/E							EOAFAT41 EOFTAT41
Construction Materials 1	BMEEOEMAT43	5		5/2/0/2/E							EOEMAT41
Civil Engineering Informatics	BMEEOFTAT42	5		5/2/2/M							EOFTAT41
Building Construction Study	BMEEOEMAT44	3		3/1/2/M							EOEMAT42
Introduction to Strength of Materials	BMEEOTMAT42	6		6/0/5/M							EOTMAT41 TE90AX00~
Hydraulics 1	BMEEOVVAT42	3		3/2/1/E							
Mathematics A2a - Vector Functions	BMETE90AX02	6		6/4/2/E							TE90AX00
Surveying Field Course	BMEEOAFAT43	3		3/0/0/M	9 days						EOAFAT42~
Soil Mechanics	BMEEOGMAT42	4			4/2/2/M						EOGMAT41 EOTMAT42
Geoinformatics	BMEEOFTAT43	3			3/2/1/M						EOAFAT42
Basis of Design	BMEEOHSAT41	3			3/2/0/M						EOTMAT41~
Structural Analysis 1	BMEEOTMAT43	4			4/4/0/E						EOTMAT42 TE90AX00
Railway Tracks	BMEEOUVAT41	3			3/3/0/E						EOAFAT41
Basics of Environmental Engineering	BMEEOVKAT41	3			3/2/0/M						
Public Works 1	BMEEOVKAT42	3			3/2/1/E						EOVVAT42
Hydrology 1	BMEEOVVAT41	3			3/2/1/M						
Mathematics A3 for Civil Engineers	BMETE90AX07	4			4/2/2/E						TE90AX02
Earthworks	BMEEOGMAT43	3				3/2/1/E					EOGMAT42
Steel Structures	BMEEOHSAT42	3				3/3/0/M					EOTMAT42 EOEMAT43~ EOHSAT41
Reinforced Concrete Structures	BMEEOHSAT43	3				3/3/0/M					EOTMAT42 EOEMAT43~ EOHSAT41
Roads	BMEEOUVAT42	2				2/2/0/M					EOUVAT41
Hydraulic Engineering, Water Manag.	BMEEOVVAT43	3				3/2/1/E					EOVVAT41 EOVVAT42
Construction Management	BMEEPEKAT41	3				3/2/1/M					EOEMAT44 EOGMAT42
Business Law	BMEGT55A001	2				2/2/0/M					
Foundation Engineering	BMEEOGMAT45	4					4/3/0/E				EOGMAT43
Management and Enterprise	BMEGT20A001	4					4/4/0/M				
Micro- and Macroeconomics	BMEGT30A001	4						4/4/0/E			
Communication Skills for Civil Engineers	BMEGT60A6EO	2						2/0/2/M			
Urban and Regional Development	BMEEOUVAT43	3							3/2/0/M		
Elective subject		4							4/4/0/M		

Curriculum of BSc in Civil Engineering
Specialization in Structural Engineering

Name	Code	Credits	1	2	3	4	5	6	7	8	Preliminary requirement(s)
Specialization in Structural Engineering											
Building Construction 1	BMEEOEMAS42	3				3/1/2/E					EOEMAT44
Timber Structures	BMEEOHSAS44	3				3/2/0/M					EOTMAT42 EOEMAT43 EOHSAT41
Strength of Materials	BMEEOTMAS41	3				3/2/0/E					EOTMAT43
Construction Materials 2	BMEEOEMAS41	3					3/1/0/2/E				EOEMAT43
Building Construction 2	BMEEOEMAS43	3					3/1/2/E				EOEMAS42 EOHSAT41
Steel and Composite Structures	BMEEOHSAS47	4					4/2/1/M				EOHSAT42 EOHSAT43
RC and Masonry Structures	BMEEOHSAS42	4					4/2/1/M				EOHSAT43 EOEMAS42 EOTMAT43
Bridges and Infrastructures	BMEEOHSAS43	3					3/2/0/E				EOHSAT42 EOHSAT43
Laboratory Practice of Testing of Structures and Materials	BMEEOHSAS46	2					2/0/04/M				EOHSAT42 EOHSAT43
Structural Analysis 2	BMEEOTMAS42	4					4/3/1/M				EOTMAT43 EOTMAS41 TE90AX07
Rock Mechanics	BMEEOGMAS41	3					3/1/1/M	3/1/1/M			EOGMAT41 EOGMAT42
Underground Structures, Deep Found.	BMEEOGMAS42	3					3/2/1/M	3/2/1/M			EOGMAT45
3D Constructional Modelling of Structures	BMEEOHSAS45	3					3/0/2/M	3/0/2/M			EOHSAT42 EOHSAT43 EOFTAT42
Design of Structures Projectwork	BMEEODHAS41	6					6/0/0/M	6/0/0/M			EOHSAS47 EOHSAS42 EOGMAT45
Public Administration and Land Registry	BMEEOUVAT44	3					3/2/0/M	3/2/0/M	3/2/0/M		GT55A001
Field Course of Structural Surveys	BMEEOAFAS42	1					1/0/0/2/M	1/0/0/2/M	1/0/02/M		EOAFAT43 EOHSAT42 EOHSAT43
Dynamics of Structures	BMEEOTMAS43	3					3/2/0/M	3/2/0/M	3/2/0/M		EOTMAT43 TE90AX07
Technical Internship	BMEEODHAS42	0					0/0/0/S	0/0/0/S	0/0/0/S		EOHSAS47 EOHSAS42 EOGMAT45
Steel Buildings	BMEEOHSA-A1	5					5/3/1/E	5/3/1/E	5/3/1/E		EOHSAS47
Reinforced Concrete Buildings	BMEEOHSA-A2	5					5/3/1/E	5/3/1/E	5/3/1/E		EOHSAS42 EOHSAS44
Methodology of Building Construction Design	BMEEOEMA-A1	2					2/1/1/E	2/1/1/E	2/1/1/E		EOEMAS43
Engineering Works	BMEEOHSA-B3	3					3/2/0/E	3/2/0/E	3/2/0/E		EOHSAT43 EOHSAS43 EOGMAS42
Structural Design Projectwork	BMEEOHSA-PP	6					6/0/0/M	6/0/0/M	6/0/0/M		EODHAS41 EOHSA-A1 EOHSA-A2
Diploma Project	BMEEODHA-PD	24								M	EOHSA-PP

Curriculum of BSc in Civil Engineering
Specialization in Infrastructure Engineering

Name	Code	Cre-dits	1	2	3	4	5	6	7	8	Preliminary require-ment(s)
Specialization in Infrastructure Engineering											
Infrastructure CAD Course	BMEEOUVAI45	1				1/0/0/2/M					EOUVAT41 EOVKAT42 EOFTAT42
Water Chemistry and Hydrobiology	BMEEOVKAI43	3				3/2/0/1/E					EOVKAT41
Legal Aspects of Water and Environment	BMEEOVKAI45	2				2/2/0/M					
Hydraulics 2	BMEEOVVAI42	3				3/2/1/E					EOVVAT42
Highway and Railway Structures	BMEEOUVAI41	5				5/4/0/E	5/4/0/E				EOUVAT41 EOUVAT42
Highway and Railway Design	BMEEOUVAI43	5					5/3/2/E				EOUVAT41 EOUVAT42 EOAFAT43
Public Works 2	BMEEOVKAI41	5					5/2/2/E				EOVKAT42
Urban Environment	BMEEOVKAI42	3					3/2/0/M				EOVKAT41
Water Quality Management	BMEEOVKAI44	3					3/2/1/M				EOVKAI43 EOVVAI42
Hydrology 2	BMEEOVVAI41	3					3/2/1/M				EOVVAT41
Transportation Networks	BMEEOUVAI42	3					3/2/0/M	3/2/0/M			EOUVAT42
Highway and Railway Laboratory Course	BMEEOUVAI44	1					1/0/0/3/M	1/0/0/3/M			EOUVAI41
Water Resources Management	BMEEOVVAI43	3					3/2/0/E	3/2/0/E			EOVVAT43
Hydraulic Engineering Field Course	BMEEOVVAI44	2					2/0/0/M	2/0/0/M			EOVVAI41 EOVVAI42
Infrastructure Design Project	BMEEODHAI41	6					6/0/0/M	6/0/0/M			EOVVAT43 EOUVAI43 EOVKAI41
Public Administration and Land Registry	BMEEOUVAT44	3							3/2/0/M		GT55A001
Earthworks and Drainage of Transportation Infrastructures	BMEEOGMAI41	3							3/3/0/E		EOGMAT43 EOVVAT41
Technical Internship	BMEEODHAI42	0							0/0/0/S		EOVVAT43 EOVVAI43 EOVVAI42
Highway Planning and Design	BMEEOUVA-E1	3							3/0/2/E		EOUVAI43
Water Damage Prevention and Water Use	BMEEOVVA-F1	5					5/4/0/E	5/4/0/E			EOVVAT43 EOVVAI41 EOVVAI42
Drinking Water and Wastewater Treatment	BMEEOVKA-H1	4					4/3/0/E	4/3/0/E			EOVKAI41
Railway Planning and Design	BMEEOUVA-E2	3							3/0/2/E		EOUVAI43
River Basin Management	BMEEOVVA-F2	3							3/2/0/E		EOVVAI43 EOVKAI44
Environmental Impact Assessment	BMEEOVKA-H3	3							3/3/0/E		EOVKAI42 EOVKAI44 EOVKAI45
Transportation Facility Design Project	BMEEOUVA-QP	6							6/0/0/M		EOHAI41 EOUVAI44 EOUVA-E2
Hydraulic Engineering Design Project	BMEEOVVA-QP	6							6/0/0/M		EODHAI41 EOVVA-F1 EOVVA-F2
Urban Water Infrastructure Design Project	BMEEOVKA-QP	6							6/0/0/M		EODHAI41 EOVKA-H1 EOVKA-H3
Diploma Project	BMEEODHA-QD	24								M	*EOUVA-QP *EOVVA-QP *EOVKA-QP

Curriculum of MSc in Civil Engineering
Structural Engineering

Subject			lectures/practical lectures/laboratory		
Name	Code	Credits	1	2	3
Core subjects					
Advanced Mathematics	BMETE90MX33	3	2/1/0/E		
Physics Laboratory	BMETE11MX22	1		0/0/1/M	
Methods of Engineering Analysis	BMEEOHSMK51	3	1/1/0/M		
Numerical Methods	BMEEOFTMK51	4	0/0/3/M		
Geodynamics	BMEEOGMMS51	3		2/0/0/M	
FEM for Civil Engineers	BMEEOTMMS51	5	2/2/0/E		
Soil-structure interaction	BMEEOGMMS52	5	3/1/0/M		
Structures 1	BMEEOHSMS51	5	3/1/0/E		
Numerical modeling project	BMEEOTMMS5P	5	0/0/0/2/M		
Decision Supporting Methods	BMEEPEKMST4	2			2/0/0/M
Accounting, Controlling, Taxation	BMEGT35M014	2			2/0/0/M
Corporate Finance	BMEGT35M411	2			2/0/0/M
Engineering Ethics	BMEGT41M004	2			2/0/0/M
Specialization in Numerical Modelling					
Obligatory Subjects					
Structural Dynamics	BMEEOTMMN-1	4		2/1/0/M	
Stability of Structures	BMEEOHSMT-2	4		2/1/0/E	
Nonlinear Mechanics	BMEEOTMMN-2	4	2/1/0/E		
Diploma Project	BMEEODHMN-D	20			
Recommended elective subjects					
Plasticity	BMEEOTMMN61	3		1/1/0/M	
Nonlinear FEM	BMEEOTMMN62	3		2/0/0/M	
Analysis of Rods and Frames	BMEEOTMMN63	3		1/1/0/M	
Discrete Element Method	BMEEOTMMN64	3		1/1/0/M	
Specialization in Structures					
Obligatory Subjects					
Structures 2	BMEEOHSMT-1	4		2/1/0/E	
Stability of Structures	BMEEOHSMT-2	4		2/1/0/E	
Seismic Design	BMEEOHSMT-3	4		2/1/0/M	
Structural Dynamics	BMEEOTMMN-1	4		2/1/0/M	
Diploma Project	BMEEODHMT-D	20			
Recommended elective subjects					
Applied Fracture Mechanics	BMEEOHSMT61	4		2/1/0/M	
Prestressing Technologies	BMEEOHSMT62	3		1/1/0/M	
Strengthening of Structures	BMEEOHSMT63	3		1/1/0/M	
Specialization in Geotechnics and Geology					
Engineering Geology MSc	BMEEOGMMG-1	4		2/1/0/E	
Environmental Geology	BMEEOGMMG-2	4	2/1/0/M		
Geotechnical Design	BMEEOGMMG-3	4		2/1/0/M	
Earthworks of Infrastructures	BMEEOGMMG-4	4		2/1/0/M	
Diploma Project	BMEEODHMG-D	20			
Recommended elective subjects					
Tunneling	BMEEOGMMG61	3		2/0/0/M	
Hydrogeology	BMEEOGMMG62	3		2/0/0/M	
Numerical Methods in Geotechnics	BMEEOGMMG63	3	1/0/1/M		
Engineering Geology of Hungary	BMEEOGMMG64	3		2/0/0/M	

Description of BSc Courses
Civil engineering BSc - Major in Structural Engineering

Compulsory English 1.

BMEGT63A3E1

The course is designed to enable students to communicate fluently and effectively in study environment. Receptive, productive and interactive activities and strategies are included in the curricula. (4 credits)

Surveying I.

BMEEOAFAT41

Surveying and Geodesy. Height systems. Optical levelling, the surveyors' level. Line levelling (procedure, field observations and processing). Systematic error sources of levelling, the two-peg-test. Line levelling, detail point levelling. Height observations for horizontal layouts.
Horizontal positioning observations. Angular observations and the theodolite. Calibration procedure of the theodolite. Measuring with the theodolites: set up, sighting, horizontal and vertical angular observations, systematic error sources. The computation of the mean direction and the zenith angle. Centring excentric observations. Trigonometric heighting.
Distance observations: corrections, reductions. Physical methods of distance measurements. Electrooptical Distance Meters. Processing distance observations.
Plane surveying. Computation of horizontal coordinates on the projection grid. Orientation of the horizontal circle. Intersections. (3 credits)

Chemistry of Construction Materials

BMEEOEMAT41

The importance and necessity of chemistry in civil engineering. The structure of atoms, the electron shell structure, the structure of molecules and chemical bonding models. States of materials - explanation by intermolecular forces. Ideal and real laws of gases. Fluid systems properties. The structure of crystalline solids (ionic, atomic, molecular and metallic lattice crystal structure and properties). Difference between ideal and realistic structure, macroscopic properties of crystalline materials, lattice defects. Structure and properties of non-crystalline (amorphous or glassy) solids. Macromolecular substances and its chemical properties. Homogeneous and heterogeneous systems. Gibbs law. interfacial phenomena. The types of chemical reactions, speed of chemical reactions. Activation energy and reaction heat. Hess's law. Chemical equilibrium. Acids, bases and salts. The pH concept. Hydrolysis of salts. Electrochemistry. Redox processes, redox potentials. Production of metals, corrosion of metals. Binding materials and binding mechanism. Cement chemistry. Chemical and mineralogical composition of cements. Hydration products, CSH, CAH, CH, primary and secondary ettringite. Application of theoretical knowledge in engineering practice. (2 credits)

Civil Engineering Representation and Drawing

BMEEOEMAT42

3 main parts of the subject: 1. Descriptive geometry 2. Engineering drawing 3. Freehand drawing. 1. Basics of descriptive geometry course modules: Students gain knowledge and skills in regularities and techniques of descriptive geometry, developing spacial reasoning. Topics: basic constructions in planes of projections, transformations, tasks of intersections, intersections and interpenetrations of plane and curved solids, cast shadows, construction in scale, special revolution solids and skew surfaces. Additional representation systems: dimensioned representations, orthogonal axonometry, perspective projection. 2. Engineering drawing course modules: Students gain knowledge and skills in engineering drawing, specific notations, proportions and scale, magnification, minification, construction of ground plans and sections. 3. Engineering free-hand representation course modules: develop free-hand drawing in scale. (4 credits)

CAD for Civil Engineers

BMEEOFTAT41

Besides an overview on CAD systems and application fields, students will learn the 2D drawing commands that enable carrying out basic design tasks. Layer management, block definition and applying annotations and dimensions are discussed in detail. Learning printing options and parameters supports further design works in the BSc civil engineering program. The aim of the course is to let students understand the potential and capabilities of CAD systems and their applications. The course introduces the basic spatial drawing solutions providing bases for high level courses involving 3D constructions, BIM applications. (2 credits)

Geology

BMEEOGMAT41

The geology provides the characterisation of geological formations and materials from a civil engineering point of view. It describes the processes and the interactions between the engineering works and the geological environment. The dynamics of the Earth, the description of raw materials and geo-materials used in engineering practice (minerals and rocks), the geological risks such as earthquakes, volcanism, landslides and their effect, characterisation of surface and subsurface waters and related geological problems. (3 credits)

Basis of Statics and Dynamics

BMEEOTMAT41

Classification of mechanics, basic vector operations. Kinematics of particles, description of motion in Cartesian coordinate system. Newton's laws of motion. Concurrent and general force systems in the plane, distributed forces: reduction, resultant, centroid, equilibration. Mechanical work. Planar motion of rigid bodies. Centroid and moment of inertia of rigid bodies. Kinetics of rigid bodies moving in the plane. Linear momentum, angular momentum, theorems of change of kinetic energy for particles and rigid bodies. Constraints. External and internal forces of planar structures and trusses. Statical determinacy. Spatial force systems: reduction, resultant, equilibration. Spatial structures. Internal force diagrams of statically determinate planar bar structures, relationships between internal force diagrams. Sliding friction and rolling resistance. (6 credits)

Mathematics A1a - Calculus

BMETE90AX00

Algebra of vectors in plane and in space. Arithmetic of complex numbers. Infinite sequences. Limit of a function, some important limits. Continuity. Differentiation: rules, derivatives of elementary fuctions. Mean value theorems, l'Hospital's rule, Taylor theorem. Curve sketchig for a func-

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tion, local and absolute extrema. Integration: properties of the Riemann integral, Newton-Leibniz theorem, antiderivatives, integration by parts, integration by substitution. Integration in special classes of functions. Improper integrals. Applications of the integral. (6 credits)

Physics for Civil Engineers

BMETE11AX13

Electric charge, Coulomb's law, electric field, electric flux. Work and energy in electric fields. Electric potential. Capacitors, dielectrics. The piezoelectric effect and its applications. The contact potential, its application for temperature measurements. Electric current, Kirchhoff's laws, electric circuits. Magnetic field. The Biot-Savart law, Ampere's law. Forces in magnetic fields, practical applications. Magnetic flux, Faraday's law. Practical applications of Faraday's law in sensors. Self induction, mutual induction. Varying electromagnetic fields. Magnetic properties of matter, magnetic circuits. ACcircuits, impedance. Sensors in measurements. Measurement of basic electric quantities. Resistance, capacitance and magnetic induction based sensors. Magnetic, thermoelectric and piezoelectric sensors. Measurement of displacement, force, acceleration. Measurement of flow of gases and liquids. Measurement of liquid level. Measurement of humidity and temperature. Thermovision, thermograms. (2 credits)

Compulsory English 2.

BMEGT63A3E2

The courses are designed to enable students to communicate fluently and effectively in study environment. Receptive, productive and interactive activities and strategies are included in the curricula. By the end of the semester the overall language ability of the students is at level B2 (by the Common European Framework of Reference
(4 credits)

Surveying II.

BMEEOAFAT42

Properties of analogue and digital maps, the application of maps in engineering practice. Traversing, the types of traverse lines. Localizing blunder in traverse lines: the linear and angular error. Offset surveys. The determination of the horizontal and vertical positions of detail points: the tacheometry. Total stations and their application in surveying. Topographic surveys: reconnesaince, sketch, detail survey and mapping. Free stationing. The principles of computational adjustments, the law of error propagation. Construction tolerances and the fundamental of geometrical quality control. Horizontal and vertical deformation monitoring. Setting out straight lines, curves, transition curves and points in a given elevation. The global navigation satellite systems (GPS, GLONASS, Galileo, ...) and their application in surveying. Building surveys. The localization of underground public utilities. Mapping public utilities and the public utility register. (4 credits)

Construction Materials I.

BMEEOEMAT43

Basic physical and hydrotechnical characteristics of the most important structural materials: stress, strength, deformation, fatigue, creep, shrinkage, toughness, relaxation, brittleness, hardness. Binding materials: Lime, gypsum, production of cements, the klinker minerals, hydration and properties. Mortar. Concrete: Aggregates, admixtures. Fresh concrete: consistency, mix design. Hardened concrete: Interpretation of strength, and its evaluation. Metals: iron, steel yield strength, ultimate tensile strength, ultimate strain, influence of temperature, weldability. Timber. Mechanical properties, shrinkage, swelling. Bricks and masonry . Main constituents and porperties of glass. Types of polymers. (5 credits)

Civil Engineering Informatics

BMEEOFTAT42

The course gives an overview on the major areas of informatics, on the components of information technology systems. Besides supporting the labs, some practical problems and particular tasks are also discussed on the lectures. On the labs, students use spreadsheet application to solve different tasks, then learn the basics of numerical and non-numerical methods in mathematical software environment. Students also learn the basics of programming; most of the tasks have to be solved by own scripts, routines, programs. Civil engineering informatics discusses 2D and 3D computer graphics and the basics of database management that supports high level courses involving spatial construction and database systems. (5 credits)

Soil Mechanics

BMEEOGMAT42

Origin of soils, soil exploration, soil samples. Components of soils (phase relationships, grain size distribution, consistency limits), soil classification, compaction. Stresses in the soil (under static conditions, conditions of steady vertical flow). Flow of water through soil due gravity (Darcy's law, coefficient of permeability, flow nets). Compressibility of soil (reasons and types of compression). Shear strength of soil (Mohr-Coulomb failure criterion, determination of shearing strength). (4 credits)

Introduction to Strength of Materials

BMEEOTMAT42

Internal forces and internal force diagrams of planar and spatial structures (revision, generalization). Moments of inertia and principal directions of planar figures. Strength properties of materials. Concept of stresses and deformations. Material models: linearly elastic material and linerly elastic and perfectly plastic material. Beam element, beam model composed of elastically connected cross-sections. Computation of normal stresses in beams for centric tension/compression, simple bending, skew bending, and tension/compression combined with bending. Computation of shear stresses in beams for pure shearing, torsion, and shearing combined with bending. Eccentric compression of cross-sections of no tension matrials. Shear centre of thin-walled cross-sections. Displacements of bent beams with straight axis. Principal stresses and principal directions. (6 credits)

Hydraulics I.

BMEEOVVAT42

Physical properties of water. Hydrostatics: pressure distribution, absolute and relative equilibrium. Equilibrium of suBMErged and floating bodies. The flow of fluids: velocity, discharge, continuity, specific energy head, other properties. Laminar and turbulent motion. Behaviour of ideal and real fluids. Outflow, through-flow. Channel flow. Hydraulic jump, energy breaker. Weirs, sluice-gates. Steady-state flow in pipes. Seepage in porous media. Wells. Turbo-machines. (3 credits)

Mathematics A2a - Vector Functions

BMETE90AX02

Solving systems of linear equations: elementary row operations, Gauss-Jordan- and Gaussian elimination. Homogeneous systems of linear equations. Arithmetic and rank of matrices. Determinant: geometric interpretation, expansion of determinants. Cramer's rule, interpolation, Vandermonde determinant. Linear space, subspace, generating system, basis, orthogonal and orthonormal basis. Linear maps, linear transformations and their matrices. Kernel, image, dimension theorem. Linear transformations and systems of linear equations. Eigenvalues, eigenvectors, similarity, diagonalizability. Infinite series: convergence, divergence, absolute convergence. Sewuences and series of functions, convergence criteria, power series, Taylor series. Fourier series: axpansion, odd and even functions. Functions in several variables: continuity, differential and integral calculus, partial derivatives, Young's theorem. Local and global maxima/minima. Vector-vector functions, their derivatives, Jacobi matrix. Integrals: area and volume integrals. (6 credits)

Surveying Field Course

BMEEOAFAT43

Using the theoretical background of the courses Surveying 1 & 2 students are required to: assess the existing datasets used for mapping; define the necessary surveying activities; practice the surveying observations, planning, data processing and documentation; practice profile boarding, setting out of roads; learn to use modern surveying instruments (total stations, GPS/GNSS receivers, electronic levels, digital photography). (3 credits)

Building Construction Study

BMEEOEMAT44

Subject of architectural engineering, fundamental terms and base definitions. elations of buildings and building constructions. Effects on buildings, requirements of building constructions. Building blocks and specific brick connections. Load-bearing wall systems and lintel beams in wall structures. Groups of foundation modes and characteristics. Water insulation of under grade parts of buildings. Slabs and ring beams. Balconies. Basics of mechanical installations of residential buildings. Frame system buildings, construction systems and materials. Structures of stairs, systematization. Railings, main coverings. Types of traditional roof trusses, specialties, rainwater gutters and roof claddings. Order of layers of flat roofs, rainwater drainage, gullies, waterproofing materials. Types and materials of typical external and internal doors and windows. Classic contact facade finishes. Basics of building physics. (3 credits)

Geoinformatics

BMEEOFTAT43

The aim of Geoinformatics is to introduce the principles and potential application fields of geographic information systems (GIS) in the civil engineering practice. The course discusses the basic concepts and applications of GIS, the modelling process needed to create GIS, the reference systems of geometric data, the spatial data sources and data acquisition methods, the aspects of data quality, the resources, tools, databases of GIS, the basics of data analysis, visualization and implementation of GIS. Through the lectures and labs students learn the GIS workflow based on desktop and web-based solutions, and tools of spatial process modelling, data management and web integration. (3 credits)

Basis of Design

BMEEOHSAT41

Modelling of structures, design process. Selection of structural form and material. Structural model. Thrust line. Probabilistic basics of structural design, partial (safety) factor method. Selection of critical load case, design load. Actions on structures. Material laws. Geometrically linear and nonlinear analysis, Elastic and plastic resistance. Superposition. Limit states. Load-carrying capacity and serviceability. Beams and columns. Design of structures for horizontal actions. Spatial structures. Classification of structures according to their form and static behaviour. (3 credits)

Structural Analysis I.

BMEEOTMAT43

Principle of small displacements: displacements of rigid body chains using small displacements. Computation of displacements of statically determinate simple and compound structures using displacement equivalency statements. Virtual force systems, concept of virtual complementary work, theorem of virtual forces. Computation of displacements of statically determinate simple and compound structures using the theorem of virtual forces. Influence lines of internal forces and displacements of statically determinate structures. Maximal internal forces. Concept of envelope curves. Computation of statically indeterminate planar structures under fix loads using the force method. Computation of statically indeterminate planar structures under moving load using the force method: influence lines. Computation of statically indeterminate planar structures under fix loads using the displacement method. (4 credits)

Railway Tracks

BMEEOUVAT41

Basic concepts of the railway tracks and vehicles, most important technical parameters. Features of normal railways, suburban railways, urban railways, classification of different types of railways. Speed, acceleration, changing of acceleration. Horizontal and vertical alignment of the railway tracks, straights, circular curves and transition curves, superelevation, vertical curves. Elements of the substructure and superstructure. Rails, sleepers, rail fastenings, ballast, subgrade, strengthening of the subgrade. Setting out major and detail points of curves and transition curves. Structures and solutions of dewatering and drainage of railway tracks. Basic concepts of conventional and continuously welded rail tracks. Types of turnouts and simple track connections. Basic concepts of railway stations, platforms, passenger access. (3 credits)

Basics of Environmental Engineering

BMEEOVKAT41

The aim of the course is to provide basic scientific and engineering background for further studies in environmental engineering by giving introduction to the following subjects: basics of ecology, the natural cycle of ecologically important elements and substances, the environmental effects of human activities, the ecological footprint, energy consumption patterns and energy production technologies, renewable energy sources. Selected environmental problems associated with civil engineering activities (water, air and soil pollution), with focus on the urban environment. Tools and methods for conducting environmental impact assessment. (3 credits)

Public Works I.

BMEEOVKAT42

The main goal of the subject is to provide information about the most important features of the public works. The subject is also including the connections between the different public works and other establishments. Further aim is to provide knowledge for the future general designers and technical managers to make the right decisions on the underground infrastructure of settlements. Main scopes are: system knowledge and design of different publc work types like water acquisiton, drinking water supply, waste water networks, storm water networks and public works asset management. (3 credits)

Hydrology I.

BMEEOVVAT41

The global water cycle. The water balance. Basic elements of hydrometeorology. Evaporation and its main features. The origin of the precipitation, quantitative characteristics, principles of precipitation. Weather, weather conditions, climate. The concept and principles of runoff. Infiltration. runoff estimation on small and large catchments. Elements of hydrography. Exploration of natural streams. Characterisation of subsurface waters and their principles. Characterisation of groundwater regime. (3 credits)

Mathematics A3 for Civil Engineers

BMETE90AX07

Differential geometry of curves and surfaces. Scalar and vector fields. Potential theory. Classification of differential equations. Linear differential equation of the second order. Nonlinear differential equations. Systems of linear differential equations. The concept of probability. Discrete random variables an their distributions. Random variables of continuous distribution. Two-dimensional distributions, correlation and regression. Basic notions of mathematical statistics. (4 credits)

Earthworks

BMEEOGMAT43

Scope of earth works. Plastic limit states, Rankine earth pressures. Earth pressure and passive resistance of "real" walls. Soilstatical design of retaining structures. Stability of earth works. Construction of earth works. The designal, executional and monitoring questions of construction. Dewatering of earth works. Geosynthetics. (3 credits)

Steel Structures

BMEEOHSAT42

Lectures of Steel Structures have the general aim to study the basics of the design of steel stuctures, which consists of the design of simple structural members, simple joints and the investigation of the basic failure phenomenon, which can occure in steel structures. The program consists of the following topics:
Steel grades, mechanical properties of the steel material. Calculation of cross sectional properties. Design of centrically loaded tension members. Design of Centrically loaded compression members. Buckling problem – behaviour – design method. Design of beams: construction, behaviour under bending and shear interaction. Beam structural behaviour - design approaches for lateral torsional buckling. Design of bolted connections. Design of welded connections. Fatigue design and brittle fracture. Plate buckling phenomena, basics of the cross section classification. (3 credits)

Reinforced Concrete Structures

BMEEOHSAT43

Structural safety of reinforced concrete (RC) structures; loads and effects on RC strucrures, material properties of concrete and reinforcing steel; moment- curvature relation of RC cross sections; Uncracked and cracked cross section; flexural strength theory, strength and ductility; design of RC cross section; eccentric compression; shear failure in beams without and with shear reinforcement; strength in bending and torsion; anchorage and stress development, bar curtailment; deflection and crack width. (3 credits)

Roads

BMEEOUVAT42

History of transportation. Sustainable transportation and transportation policy. The system of tracks, vehicles and drivers/passengers. Design and behavioural patterns and self-explaining roads. Transport facilities. Elements of the alignment in cross sections, horizontal and vertical alignment. Basic rules and disciplines of planning and design. Transition of superelevation. Planning process: planning, design project, construction, operation. Traffic operation basics: measures of traffic, traffic operation and management. Intersections and junctions. Urban transportation planning, the concept of accessibility. Characteristics, production and installation of asphalt pavements. Types of tracks, layers, materials. Design of new pavement structures. Construction, management and operation of road networks. Project 1: Authorization plan of a curved section of a secondary main road with transition curves: site plan on a contour line map with long section and cross sections. Drainage, earthwork, road marking. Project 2: Feasibility study of a main road between two point on a contour line map. (2 credits)

Hydraulic Engineering, Water Manag.

BMEEOVVAT43

The tasks, methods and tools of water management. Hungarian and European specialities of water management. Types and tasks of hydraulic engineering structures with the following topics: Watershed management of lowland and hilly areas, regulation of lakes and rivers, reservoirs and storage, flood control and land drainage, inland navigation, water power development, water intake and pumping stations, small hydraulic engineering structures, caracteristic environmental impacts of hydraulic engineering structures. During the practical lessons four design works will be elaborated. (3 credits)

Construction Management

BMEEPEKAT41

Curricula, themes, individual projects, tests, subjects of lectures and seminars of the Course are embracing managerial and organizational learnings useful and necessary for all civil engineers, such as:
- jobs and organizational structure of Contracting Construction Trade; - jobs and relations of parties collaborating in executing construction projects; - time and resource needs of executing construction projects (basic methods and terms of time-, resource- and cost estimates); - basics of mechanizing Construction, construction equipments and auxiliary plants, typical applications; - organizing construction site (site layout designs).
Individual project: Organizational plans (time estimates, resources calculations and site layout designs) of building a simple linear structure (reinforced concrete retaining wall) well known in practice of all civil engineers. (3 credits)

Business Law

BMEGT55A001

The problems of the area will be treated in two major parts. Part One introduces students to the general topics, for example the concept of law, the functions of the law in the socieconomic life. Some basic legal problems, like the conception, characteristics and functions of the modern state and, in a comparative view, the characteristics of the Anglo-Saxon and continetal systems of business law and the development of the Hungarian business law will be also discussed. The emphasis of Part Two is on the questions of company law and competition law presented in a European context. The lectures of this part outline not only the regulations of the Hungarian Company Act and Company Registry Act but they cover EU directives and regulations on companies and competition as well. (2 credits)

Foundation Engineering

BMEEOGMAT44

Foundation Types.Design of rigid and flexible shalow foundations (spread, pier, slab, box foundation). Determination the bearing capacity and settlements of soils under load. Factors effecting the value of differential settlements. Stability analysis. Types and design of different support systems of Excavations. Bearing capacity of pile foundations. Anchorages. Design of ground Anchors. Design and construction of cast in situ and prefabricated diaphragm walls. Dewatering. (4 credits)

Management and Enterprise

BMEGT20A001

Intended for engineering students who would like a better conceptual understanding of the role of management int he decision making process. This course introduces the essentials of management as they apply within the contemporary work environment. Particular attention is paid to management theories, corporate finance, leadership, teamwork, quality management, management of technology, economics calculation and operations management. For problem formulation both the managerial interpretation and the mathematical techniques are applied. (4 credits)

Micro- and Macroeconomics

BMEGT30A001

Introduction to macroeconomics. Output and aggregata demand. Fiscal policy and foregn trade. Money and banking. Interest rates and monetray transmission. Monetray and fiscal policy. Aggregate supply, prices and adjustment to shocks. Inflation, expectations, and credibility. Unemployment. Exchange rates and the balance of payments. Economic growth. Economics and the economy. Tools of economicanalysis. Demand, supply and the market. Elasticities of demand and supply. Consumer choice and demand decisions. Introducing supply decisions. Costs and supply. Perfect competition and pure monopoly. Market structure and imperfect competition. The labor market. Factor markets and income distribution. (4 credits)

Communication Skills for Civil Engineers

BMEGT60A6EO

The Communication Skills course is designed to meet the language needs of civil engineering students in academic and professional fields. Special emphasis is on the language of meetings and discussions, oral presentation and summary writing. (2 credits)

Urban and Regional Development

BMEEOUVAT43

Infrastructure and Regional Development. Historical construction processes of canals, railways, motorways. Aviation and the internet age. Livable, sustainable cities, regions. Computer aided teamwork. Construction projects, mobility measures; parking regulations. Improving traffic safety, Traffic management and intelligent investments. Basics of Land-Use Planning. Cities with road pricing, congestion pricing. Lessons learned in Oslo, London, Stockholm, Singapore. Calculations with demand curves.

The city as a system. [Area, core network]. The morphology of the city. Basics on the the Hungarian settlement system. Development of large cities. Concentration, suburbanization. Fundamentals of urban planning. Case studies: Paris, Budapest – Vienna – Prague.

The regional development strategy of the European Union. Steps and documents of the implementation in Hungary. Strategic Environmental Assessments. Monitoring of Environmental Effects. (3 credits)

Branch of Structural Engineering

Building Construction I.

BMEEOEMAS42

Students gain knowledge and skills during the semester work in the following topics: Flat and deep foundations, relation to sub-soil insulation of buildings. Masonry works, prefabricated panel systems. Plasters and ETICS. Reinforced concrete, steel and wooden beam slab constructions. Stairs. High roofs. Passable and non-passable flat roofs, green roofs. Insulations against functional water. (3 credits)

Timber Structures

BMEEOHSAS44

Introduction and comparative analysis of existing timber structures. Material characteristics and strength grades of timber material. Design of timber structural members for ULS according to EC5 (compression, tension, bending, shear, torsion, combined actions, stability analysis). Design of timber structural members for SLS according to EC5 (deformations, durability). Basis of the fire design of timber structures. Design of single and multiple shear plane connections with metal dowel-type fasteners (nailed and bolted connections). Design of connections with punched metal plate fasters, split ring connectors and toothed plate connectors. Bonded connections, design of glued-laminated timber structures. Analysis of stress concentration sites in timber structures. Constructive protection methods and typical construction details of timber structures. (3 credits)

Strength of Materials

BMEEOTMAS41

Differential equation of the elastic curve, computation of the deflected shape for various boundary conditions. Virtual displacement systems, virtual work. Theorem of virtual displacements. Computation of external and internal forces of statically determinate structures using the theorem of virtual displacements. Concept of potential energy, theorem of stationarity of potential energy, application of the theorem for the computation of displacements of structures. Concept of complementary potential, theorem of minimum complementary potential energy, using the theorem for the computation of reactions of structures. Revision of common work and energy theorems of mechanics. Characterization

of equilibrium states, concept of critical load. Methods of stability analysis: statical, kinematical, and energy methods. Elastic Euler buckling. (3 credits)

Construction Materials II.
BMEEOEMAS41

Importance of selection construction materals. Ranges of applicability of construction materials. Influencing factors to the strength of concrete. Steam curing. Influencing factors to the water tightness and the freeze-thaw resistance of concrete. Fibre reinforced concrete. Light weight concrete. Metals. Aluminium. Production of iron and steel. Steel-carbon interaction diagram. Martenzite. Heat curing of steel. Steel corrosion. Normal potential. Roads. Road making materials. Aggregates and possible binders to pavements. Properties of bitumen and asphalt. Concrete pavements. Properties of road marking. Concrete corrosion. Protection against concrete corrosion. Properties of polymers. Polymeric protection layers. Thermal and sound insulations. (3 credits)

Building Construction II.
BMEEOEMAS43

Floor structures, finishes, orders of layers: floors on ground, floors of intermediate slabs, floors of attics, terraces, prefabricated concrete and stone pavings. Tile and plate roof claddings, metal sheet seamed strip claddings: orders of layers, materials, rules of technique, details, rainwater gutter systems. Structures of built-in-roofs: structures and roofing of pitched roofs, orders of layers, foils of vapour-/air-/waterproofing. Facade claddings: plastered, thermal insulated, assembled light and heavy claddings. Posterior thermal insulation of facades. Curtain walls, glass roofs. Structures and materials of dry technologies: assembled walls, ceilings, floors. Building physics: thermal and vapour protection. Acoustics, protection against noise. Building construction solutions of building reconstruction, tasks of refurbishment. (3 credits)

Steel and Composite Structures
BMEEOHSAS47

Design specialities of plated steel girders: plate and web buckling phenomena and design according Eurocodes. Design of steel structural members subjected to bending and axial compression – interaction formulae according EC3. Simple joints in steel structures – structural behaviour and design. Structural behaviour of steel and concrete composite members; design of composite beams and columns according EC4. (4 credits)

RC and Masonry Structures
BMEEOHSAS42

Design principles of reinforced concrete slab and frame structures, exact and approximate design methods, structural details. Bracing systems of reinforced concrete buildings, determination of the forces acting to the individual shear walls, checking of stability. Detailing of reinforced concrete structures (beam end, corbel, frame corner, curved bars, stairs, force transfer between members, expansion joints, etc.). Types and strength characteristics of masonry. Design principles of unreinforced masonry walls according to EC6. Reinforced masonry walls. (4 credits)

Bridges and Infrastructures
BMEEOHSAS43

Historical development of bridges. Basic terms of bridges. Classification of bridges. Superstructure systems. Typical superstructures of steel, steel and concrete composite as well as concrete bridges. Composite action between main girders. Basis of bridge design. Traffic load models and their application rules for highway and railway bridges. Testing of bridges. Substructures of bridges: abutments and piers. Bridge equipment. Conceptual design of bridges. Fitting of bridges into environment, bridge aesthetics. Supervision of bridges. Reconstruction and strengthening of bridges. Civil engineering work in traffic infrastructure, systems and hydraulic engineering. (3 credits)

Laboratory Practice of Testing of Structures and Materials
BMEEOHSAS46

Experimental demonstration the behaviour of the loaded structural members and joints made from different materials (steel, reinforced or prestressed concrete, composite, glass...). Introduction into different experimental and measurement techniques and equipments. Up-to-date building materials and material testing methods. General and specific analytical and diagnostic methods for building materials and structures. (2 credits)

Structural Analysis II.
BMEEOTMAS42

Problem statements for mechanical problems. Solution with approximative displacement functions, Ritz method. Fundamentals of the finite element method. Fundamentals of matrix analysis and application for computation of structures. Equations of the Euler-Bernoulli beam model. Equations of the Timoshenko beam model. Models of bar structures: equations of truss, grid, planar and spatial frame models. Differential equations of the classical plate theory. Differential equations of the Mindlin plate theory. Analytical solution methods for the equations of plate problems, application of the finite element method. Differential equations of the discs in the states of plane stress and plane strain. Analytical solutions of discs problems, application of the finite element method. Derivation of shell models, shell elements of the finite element method. (4 credits)

Rock Mechanics
BMEEOGMAS41

Petrophysical properties of solid rocks, the characterisation of rock blocks and rock masses, the jointing system in the rock environment. The deformation processes and rheological characters in rock mechanics, the influence of joint spacing. The durability and effect of rock environment on the engineering structures. The evaluation of geological conditions in rock environment at tunnels foundations and rocky slopes. The influence of material properties on the petrophysical properties of rocks. (3 credits)

Underground Structures, Deep Found.
BMEEOGMAS42

Types and field of application of deep foundations (stone columns, diaphragm walls). Load transfer mechanizm of deep foundations. Determination the bearing capacity and settlement by different methods (by theoretical formulas,load tests,sounding).Design and construction of Pedestrian subways, Underground garages. Analysis against uplift. Insulations. (3 credits)

3D constructional modelling of structures

BMEEOHSAS45

The aim of the course is to introduce the 3 dimensional detailing of steel-, reinforce concrete- and timber structures to the students. The course intends to develop basic practical skills by real 3D modelling of structures where the model is able to provide drawings and lists automatically for fabrication and construction processes. The course provides insight into the integration of the 3D constructional model of structures with other branches like architectural, mechanical, electrical and plumbing models into a BIM (Building Information Modelling) model. The students will learn the necessary knowledge and also obtain experience for the later project home works and diploma works by the help of presentations, small examples and a modelling home work. (3 credits)

Design of Structures Projectwork

BMEEODHAS41

Students need to accomplish a complex design projectwork that is based on the knowledge gained through the branch courses. The project work is supervised by three lecturers from three areas of structural engineering. (6 credits)

Public Administration and Land Registry

BMEEOUVAT44

Preparation of major civil engineering projects. Governance of Civil Engineering activities. World-wide examples. Case studies for Public Transport and/or Water Management. Private and public projects. Investments by modern Public Private Partnerships. Lessons on Civil Engineering "Mega-Projects". [Major Canals, Bridges. Motorways. Channel Tunnel, Oresund Bridge.] Student studies and presentations on actual projects. Public participation. The Role of Civil Organisations. Chamber of Engineers, Institute of Civil Engineers. International Organisations. [PIARC, IRF, UIC, UITP, IABSE, IAHR]. The process of public procurements. Competition and transparency requirements.
Authorisitation processes. Participants and stake-holders. Legal and administrative requirements. Environmental Acts, Decrees and Guidelines. Land registry processes and tasks. Real estate valuation. Elementary Cost – Benefit – Analysis. Financing and banking requirements. (3 credits)

Field Course of Structural Geodesy

BMEEOAFAS42

The main purpose of the subject is introduce the most modern techniques and methods for students in the field of state surveying and movement detection of civil engineering structures. The students apply the skills and knowledges learned in Surveying I, II and Field Course of Surveying to solve more complex structural engineering projects. Project are solved by students team. During the practices students survey some inner parts of a more levelled building, determine the geometry of axis of an about 30 m high brick chimney. Furthermore they determine the deflections of a slab and the distortions of floor. They determine the deflection of a cable bridge caused by traffic. They are introduced into the applications of photogrammetry, remote sensing and laserscanning in the area of construction engineering. (1 credit)

Dynamics of Structures

BMEEOTMAS43

Computation of the equivalent mechanical model of structures with a single degree of freedom: stiffness, mass, damping, consideration of friction. Differential equation of motion. Vibration of mechanical systems with a single degree of freedom: free vibration, forced vibrations with harmonic excitation, general excitation, and excitation with support motion for undamped and damped systems. Modeling of systems with multiple degrees of freedom, meaning of the matrices of the system. Differential equation system of motion. Vibrations of mechanical systems with multiple degrees of freedom: free vibration, forced vibrations with harmonic excitation, general excitation, and excitation with support motion. Free vibrations of continua: differential equation of vibrating strings, axial and flexural vibration of beams. Fundamentals of earthquake analysis, response function of structures, meaning and usage of response spectrum. (3 credits)

Industrial Practice

BMEEODHAS42

20 days of industrial practive at a civil engineering construction company. (0 credits)

Major of Buildings

Steel Buildings

BMEEOHSA-A1

Low rise industrial halls. Lattice girders. Crane girders. Design of secondary members (purlins, sheeting). Analysis and design: Principles, analysis and modelling methods, global analysis of frames.
Stability analysis and design of steel structures. Floor systems, design of composite floor systems. Joints and connections in steel and composite building structures. Bracing of steel and composite structures. Seismic design of structures. Fire design. Highrise and tall buildings. (5 credits)

Reinforced Concrete Buildings

BMEEOHSA-A2

Formation of reinforced concrete buildings, loads and effects, basics of earthquake design. Plastic behaviour of flat slabs, prestressing. Structural systems of highrise buildings. structural elements of the stiffening systems: shear walls, flat-slabs, cores, frames with masonry infill. Formation of timber halls, sizing of prefabricated prestressed and glued laminated timber structural elements. Masonry structures. (5 credits)

Building Construction Methodology

BMEEOEMA-A1

During the semester methodology of planning, methods of design of building constructions are presented. Listing of requirements depend on function of building (building physical, acoustical point of views and fire protection). Designation of structural hierarchy based on the determined requirements. Building constructional relationship and design rules: i) skirtings - connections of load-bearing structures ii) structures of floors (floors on ground, floors of general slabs) - connections of load-bearing structures iii) facade - connections of load-bearing structures iv) thermal insulation and rainwater seepage, soil moisture and waterproofing - connections of load-bearing structures v) special

building constructions (windows, doors, gates), structures of fire protection (skylights, suspended walls against fume spreading). (2 credits)

Engineering Works

BMEEOHSA-B3

The basis of the design and construction of engineering works is presented. The discussion holds on the waterproofing of reinforced concrete structures with waterthight concrete, on the thermal effects and on the description of time dependent strains of concrete structures. The use of cast-in-place and precast concrete in engineering works is presented. Some other modules: modelling the soil and structure interaction. Design aspects of pools, tanks and tower-like structures. Internal forces and reinforcements of typical structural elements of engineering works: rectangular, circular and ring plates, walls, wallbeams, box-like and shell structures. Dynamics of tower-line structures: wind effects and seismic action, dampers, wind turbines. (3 credits)

Building Design Projectwork

BMEEOHSA-AP

Students need to accomplish a complex projectwork that is based on the major subjects. Students need to regularly attend consultations and get support from the supervisor(s). (6 credits)

Diploma Project

BMEEODHA-AD

(24 credits)

Elective option:

Reinforced Concrete bridges

(BMEEOHSA-B2)

Long-term behaviour of concrete. Typical cross-sectional forms of concrete superstructures. Reinforced concrete slabs. Grid type and box girder bridges. Precast concrete superstructures. Prestressing in bridges: idea and technologies. Modern construction methods: incremental launching, segmental and monolithic balanced cantilever methods. Cable-stayed bridges. Arch bridges. Maintenance and strengthening of concrete superstructures. Typical structural types of timber bridges: truss, frame, arch, plate, hipped-plate and suspension bridges. Structural analysis of timber pedestrian bridges. Durability and fire timber bridges. Constructive timber preservation. (4 credits)

Description of MSc Courses
MSc in Structural Engineering

Advanced Mathematics

BMETE90MX33

Heat equation on an interval. The wave equation on an interval The wave equation on the line. Convolution Fourier transform. The fundamental subspaces of a matrix. Orthogonal projection to a subspace. Power method. Singular value decomposition. Pseudoinverse. (3 credits)

Physics Laboratory

BMETE11MX22

Measurement of the eigenmodes of a vibrating string by an oscilloscope. Study of the excited vibration of a mass on a spring with the help of a computer controlled ultrasonic distance detector. Basic measurements in optics (lenses, prism, polarization, diffraction). Measurement of submicron expansions (thermal expansion, magnetostriction) by Michelson interferometer. Measurement of specific heat and the heat of fusion in a stainless steel vacuum flask. Study of a solar collector model system. (1 credits)

Methods of Engineering Analysis

BMEEOHSMK51

The objective of the course is that the student shall understand and be aware of the principles and basis of methods of engineering analysis and assessments, statistics, probability theory, reliability analysis, numerical methods, risk analysis, optimization and digital sign processing. It also serves as the basis of the subsequent MSc subjects on modelling, design and programming. (3 credits)

Numerical Methods

BMEEOFTMK51

The aim of this course is that students learn and apply skill level at solving engineering problems numerically on computers, as well as to introduce the basics of Building Information Modelling (BIM). At the beginning of the semester BIM systems and their application opportunities are introduced, later the principles of the most relevant numerical techniques including their advantages, disadvantages and applicability are presented during laboratory practices. Students may learn and apply mathematical procedures suitable for solving and visualizing technical problems on computer practices. A further purpose of this course is to prepare the students for later independent research. (4 credits)

Building Physics

BMEEOEMMS51

The aim of the subject is that the students get to know the basics of modern building physics, the theory of the heat conduction, convection, heat radiation, heat transport processes, the tech-nical alternatives of the heat loss reduction of buildings and building constructions, the role of outdoor and indoor environment-related boundary conditions in building physical calculations and the method of determining these parameters, the analytical calculations of the of heat transport, the theory and practical application of non-steady-state, transient, non-linear and multi-dimensional heat transport processes, as well as conjugated heat-moisture and air transport simulations, and basics of city-scale building-physics. (3 credits)

Geodynamics

BMEEOGMMS51

The subject focuses on the understanding of dynamic effects that are transferred from the geological environment to the engineering structures. The students are getting familiar with geophysics, rock stress and its interpretation and graphic representation, local and world-scale (Word Stress Map). The deformations caused by seismic waves in igneous, metamorphic and sedimentary rocks also form part of the subject, as well as deformations caused by historic earthquakes. A main topic is the understanding of the Earth's

structural geology and seismicity with special emphasis on the Carpathian basin. The lectures will help in learning the detection methods of seismic waves and acquire the information content of the seismograms. By completing the course the students will able to determine the parameters that are necessary for appropriate seismic design. Engineering seismological approach will help the students to place the structures in the geological environment allowing the minimal risk and reducing the cost by proper seismic design. (3 credits)

Materials' science for civil engineers

BMEEOEMMS52

Main objective of this subject is to learn a wide range of special material properties used for structural design. Within this subject special material properties and material processes are taught including: definition of performance based material properties, role of micro-structure of materials to their properties, related physical-chemical processes, possibilities in modelling, re-lationship of sustainability – durability – service life, possibilities of nanotechnology in civil en-gineering, possibilities in reuse and recycling in civil engineering. (3 credits)

FEM for Civil Engineers

BMEEOTMMS51

The goal of the subject is to present the theoretical bases of the finite element method and its practical application to typical structural engineering problems. The classic approach to the finite element method will be followed in presenting the basic idea of the method, the element types, the applied interpolation functions, the various matrices and the basic steps of their construction, the resulting system of equation and the solution techniques of it. All these will be demonstrated and practiced through examples, showing how the various structure types (trusses, beams, frames, plates, shells, 3D solids) can be analysed. An introduction to nonlinearities from various sources will be given, with special focus on the effect and handling of geometric nonlinearity. Beside the static problems, the application of the finite element method to some heat transfer problems of the structural engineering practice will also be discussed. (5 credits)

Soil-structure interaction

BMEEOGMMS52

The scope of the subject is to teach the students the fundamentals of geotechnics required for structural design, such as familiarity with and use of EC7. These include geotechnical categorization; types and contents of geotechnical documentations; geotechnical and structural design of piles for different loading types, design of soil-supported ground slabs along with the determination of the values of subgrade reaction modulus; design of pile-supported ground slabs and "rigid inclusion" slabs; structural design of excavation support structures, determination of soil reaction moduli along with their effect on deformations and internal forces; design of ground anchors; geotechnical questions of bridge abutments; and the basics of soil dynamics and geotechnical earthquake engineering. (5 credits)

Structures 1

BMEEOHSMS51

The objective of the subject is the modelling of beams, membrans, plates and the simplest circular shell structures. The most important analytical solutions, the basics and assumptions of numerical solutions are introduced. It's

presented that the different structural considerations can be implemented in the design codes and regulations. The fundamental membrane solutions, shear lag effect, effective width, shear deformation, second-order effects and large deformations, anisotropy and the vibration of floors are also analysed. The main focus of the subject is the analysis of plates and slabs. (5 credits)

Numerical modeling project

BMEEOTMMS5P

The goal of the subject is that the students solve a civil engineering problem the complexity of which is in accordance with the level of the MSc course and with the credit and time-frame of the subject. The problem should be solved by high level application of some analytical or numerical method (e.g., finite element method). The problem is solved by the individual work of the student, helped by a tutor. (5 credits)

Structures project

BMEEOHSMS5P

The objective of the course is that the student shall solve a structure-specific problem, by which his/her problem solving skills are improved, gains the skill of literature review, aims the comprehensive thinking. Aim is that the student becomes able to efficiently solve problems arising during design or research tasks. The subject of the study can be any structure-related problem discussed and agreed with the supervisor; not exclusively: modelling, analysis and/or design of part of or whole structural system, experimental analysis; research, research and development or expert design task; based on individual problem statement or joining to ongoing research program. (5 credits)

Geotechnical and engineering geological project

BMEEOGMMS5P

The goal of the subject, that the students are getting familiar with the geotechnical and engineering geological design process. The students get to know through a project work the geotechnical, engineering geological data collection, modelling, design and calculation tasks. Furthermore, they get familiar with practical application of analytical and numerical design methods. (5 credits)

Decision Supporting Methods

BMEEPEKMST4

The aim of the course is to familiarize students with some practically used or usable mathematical models in the field of construction management, scheduling and tendering process. The course covers a wide variety of topics dealing with least cost scheduling problems, multi attribute decision models, learning curves. There are two computational modeling tasks as homework assignments. Final grades will be based on the two assigned tasks 15-15% and test 70%. (2 credits)

Accounting, Controlling, Taxation

BMEGT35M014

The main issues of 'window dressing' and their interpretation through financial ratio analysis and interpretation. The cost volume profit analysis and its relationship with costing and pricing decision-making. The operational and capital budgetary process in an international context and its advisory role through the process of variance analysis. The best international accounting practice both at the functional,

planning and strategic stages. The wider developmental strategic and ethical international issues concerned with managerial accounting. (2 credits)

Engineering Ethics

BMEGT41M004

The purpose of this course is to help future engineers be prepared for confronting and resolving ethical issues that they might encounter during their professional careers. It gives an overview of the moral problems engineers face in their different social roles, and it provides conceptual tools and methods necessary for pursuing those issues. Topics include engineering professionalism; social roles of engineers; ethical theories; ethical decision making techniques; social impacts of engineering, professional organizations; code of ethics of engineering societies. Case studies are discussed in a practice oriented approach. The primary goal is to stimulate critical and responsible reflection on moral issues surrounding engineering practice. (2 credits)

Structural Dynamics

BMEEOTMMN-1

The purpose of the course is that students become familiar with the dynamic tasks occurring in the structural engineering practice, and the mechanical-mathematical background of their solution methods. There will be emphasized: the differential equations used to describe the continuum of mechanical vibration and their analytical and numerical solution methods, free vibration of multiple degrees of freedom systems and its approximate solutions, computation methods of mass and stiffness matrix of the (finite element method) discretized structures, taking into account the damping, dynamic issues supporting effect of the soil, the mechanical background of earthquake analysis of structures and the efect of wind. (4 credits)

Stability of Structures

BMEEOHSMT-2

The objective of the subject is the presentation of the most important problems in the stability analysis and stability design of steel structures. The student will learn the terminology of theory of engineering stability and theory of torsion of thin-walled members, as well as their practical importance and applicability. The most relevant modes of instabilities of engineering steel structures will be presented (flexural buckling, flexural-torsional buckling, lateral-torsional buckling, plate buckling). To each instability mode the student will learn the background and mathematical bases, as well as the Eurocode design procedures and their practical applications. (4 credits)

Nonlinear Mechanics

BMEEOTMMN-2

The subject is the continuation of the Strength of Materials subjects taught in the Civil Engineering BSc programme on the expansion and the generalization of its linear models. Its two main goals are:
A./ the students will become acquainted with the approaches of nonlinear mechanics, its variables used in theoretical and numerical modeling, and the principal equations required for the formulation of nonlinear mechanical problems. The application of various nonlinear strain and stress tensors is analysed, furthermore the origination of the equations in the form of a general boundary and/or initial value problem or as a variational problem formthe most important types of engineering structures.
B./ The second important goal is to get to know the theo-

retical background required for the - primarily finite element - analysis of nonlinear problems, with an emphasis on the tehoretical and practical differences between the linear and nonlinear analysis. (4 credits)

Plasticity

BMEEOTMMN61

The purpose of the subject is, that the students acquire the basic concepts and methods of plasticity. In the frame of this they will get to know the material models, yield and hardening conditions of plasticity. The torsion problem of prismatic bars, and planar problems of solids will be learnt through examples and applications. There will be an emphasis given to the plastic load bearing capacity of elasto-plastic frame structure, and their limit states. (3 credits)

Nonlinear FEM

BMEEOTMMN62

The main goal in this subject is, that the students get to know the solution with the finite element method (FEM) of the nonlinear mechanical problems typical in engineering practice, alongside with the mathematical background of the solutions. The specialities of one- and multidimensional problems will be discussed. There will be interpreted the nonlinear behaviour of the most important stuctures (beams, frames, plates, shells) from the practical use, with a focus on the important questions about the effect of large displacements and plastic deformations. Beyond the general nonlinearity the students will learn the special techniques (finite strip method, finite volume method, boundary element method, meshfree methods, smooth and finite particle methods, etc.). As an organic part of the course, students will analyse case studies solved by computer simulation, in order to deeper understand the modeling techniques of various nonlinearities and connect theory and practice. (3 credits)

Analysis of Rods and Frames

BMEEOTMMN63

The goal of the subject is to get students to know the modeling possibilities of rod structures appearing in the structural engineering practice, the theoretical background of the models. Based on the linear mechanical model of the generalized beam element students will be acquainted with the calculation of the stiffness matrix and load vector of frame structures and their generalizations e.g. trusses, grids, and infilled frames. Higher-order analysis of kinematically indeterminate structures with high importance in engineering practice will be learnt. (3 credits)

Discrete Element Method

BMEEOTMMN64

The goal of the subject is to get students to know the basics of the concept and methodology of the discrete element methods (DEM) occurring in the structural engineering practice, and allow an insight to the operation of a discrete element software. Students will learn the most important variations DEM, th applied equations of motion, their numeric solution methods with the limits of applicability, advantages and disadvantages. Students will analyse the model of a simple engineering problem. (3 credits)

Structures 2

BMEEOHSMT-1

The objective of the subject is the presentation of the hazards, structural reliability and their role in structural design. The behaviour of complex structures, curved steel and concrete shells, 3D truss structures and their design are introduced. The most important analytical solutions and the basics and assumptions of numerical solutions are presented. Additionally, the design methods of cable and membrane structures are concluded in the subject. (4 credits)

Stability of Structures

BMEEOHSMT-2

The objective of the subject is the presentation of the most important problems in the stability analysis and stability design of steel structures. The student will learn the terminology of theory of engineering stability and theory of torsion of thin-walled members, as well as their practical importance and applicability. The most relevant modes of instabilities of engineering steel structures will be presented (flexural buckling, flexural-torsional buckling, lateral-torsional buckling, plate buckling). To each instability mode the student will learn the background and mathematical bases, as well as the Eurocode design procedures and their practical applications. (4 credits)

Seismic Design

BMEEOHSMT-3

The objective of the course is that the student shall understand the description and characterization of seismic effects and consequences, shall be aware of the basic principles of vibration analysis, behaviour, analysis and design of single and multi degree of freedom elastic or elasto-plastic structural systems, simplified modelling techniques of structures, principles of design regulations and codes, behaviour and design methods of quasi-elastic and dissipative structures. (4 credits)

Applied Fracture Mechanics

BMEEOHSMT61

The objective of the subject is the presentation of the basic theories and methods of fracture mechanics,and their application in the field of civil engineering. The basic definitions of fracture mechanics and their mathematical representation, and the basic calculation methods are also introduced. The design methods in Eurocode based on fracture mechanics are presented. (4 credits)

Prestressing Technologies

BMEEOHSMT62

The objective of the subject is the presentation of the prestressed structures and its design procedures. The main types of prestressed structures, applied materials and prestressing technologies are introduced. The effect of prestressing for the design procedures is discussed. Special prestressed structural systems and prestressing technologies for bridges are also presented. The Eurocode based design procedures and their practical application are showed. (3 credits)

Strengthening of Structures

BMEEOHSMT63

The objective of the subject is the presentation of the diagnostic of existing structures with different materials and structural systems, the possible causes of structural damages, methods of reinforcement and the most common building materials. According to this, the tools and steps of the diagnostic of existing structures, the verification of the structure's load bearing capacity, the basic principles of qualification, the required content of expertise, the methods of reconstruction and reinforcement, the most common ways of structural damages (direct and indirect) and the different structural systems of existing residential buildings are presented during the semester. Case studies are also introduced. (3 credits)

Engineering Geology MSc

BMEEOGMMG-1

The goal of the subject, that the studnets get familiar with the physical properties of the main type of rocks. It is introducing to the students the most common types of landslide problems, their solutions, the risk analysis in the field of engineering geology, the importance of the in-situ stresses in the rock mechanical design. The students get to know the theoretical background of the rock mass classification systems, the relations between the different rock mass classification systems. They learn to use these systems for rock engineering design in normal and weak rock masses. With the completion of the subject they learn to use the introduced design methods and monitoring through examples. (4 credits)

Environmental Geology

BMEEOGMMG-2

The students are getting familiar with the pollution sources that endanger environment and understand the mitigation methods. The subject provides information on the transport mechanism of pollutants in subsurface area and the conditions that influence their dispersion. The studied topics include the legal regulation of environmental geological surveys and the geological constrains of environmental impact assessment of existing and planned engineering structures. By studying remediation techniques the course leads a better understanding of various methods of pollutant removal from the geological environment. Special focus area is mining related pollution and site remediation. Waste disposal and pollution control also form important parts of the course. The exercise classes help students to learn environmental geological practice that helps in the sustainable operation and design of engineering structures. The course provides perspectives in environmental pollution reduction and in cost effective mitigation of polluted sites. (4 credits)

Geotechnical Design

BMEEOGMMG-3

The goal of this course is to acquire knowledge of the basics of geotechnical design, geotechnical approaches according to Eurocode 7, requirements of the contents of infrastructural and structural plans, methodology of soil borings and complex laboratory tests, evaluation of in-situ tests results, design optimization of large-scale geotechnical projects, soil anchor and soil nail design, jet-grouting technology and its design, design and qualification of subgrades and subbases, design of monitoring systems and design based on observation. (4 credits)

Earthworks of Infrastructures

BMEEOGMMG-4

The aim of the course is that the students understand the geotechnical aspects of infrastructures' earthworks. In this course the student gets to know the effect of earthquakes on subsoil and earthworks (damages, stability calculation, liquefaction, case studies, failures), the concepts of embank-

ment construction on soft soils (primary consolidation, secondary compression, wick drains, vibroflotation, dynamic compaction, dynamic replacement, staged construction), design, construction and control of soil and rock dams and flood protection dikes, and calculation of quick condition and sandpiping. (4 credits)

Tunneling

BMEEOGMMG61

The goal of this course is to teach the most important segments of the tunnel design and the construction. The course is focus on the frequently used tunneling technics and calculation methods in both soil and rock environment. During the semester the student calculates the most important stresses on the tunnel, using both numerical and analytical methods. The tunnel designs are shown in a detailed both the construction and operation system, as well. (3 credits)

Hydrogeology

BMEEOGMMG62

The goal of the subject, that the students getting familiar with the geological, geophysical methods of water exploration, the stratigraphy of ground, karstic and fissure water, the origin and properties of ground water (temperature, chemical nature). The students acquire the methodology for recharge, water flow, infiltration calculations, furthermore the water level and discharge measurements, water tracing and modelling the water flow in karstic and jointed rock mass. They learn the properties, classification and usage of thermal water. The subject introduce to the students the regional water management, the hydrogeological effect of mining and civil engineering, protecting of water resources through case studies. They get information about the dewatering methods and learn the usage of hydrogeological models for civil engineering works. (3 credits)

Numerical Methods in Geotechnics

BMEEOGMMG63

The aim of the course is that the students get to know the use of numerical methods that aid the geotechnical and engineering geological design. The students get familiar with the advantages and disadvantages of analytical methods and applications of finite element methods to geotechnical and engineering geological problems by using different commercially available software. The students get to know the special elements and material models that are typically used in case of FE modelling of geotechnical problems. The students get to know the most frequently used rock mechanical methods for modelling fractured rocks. (3 credits)
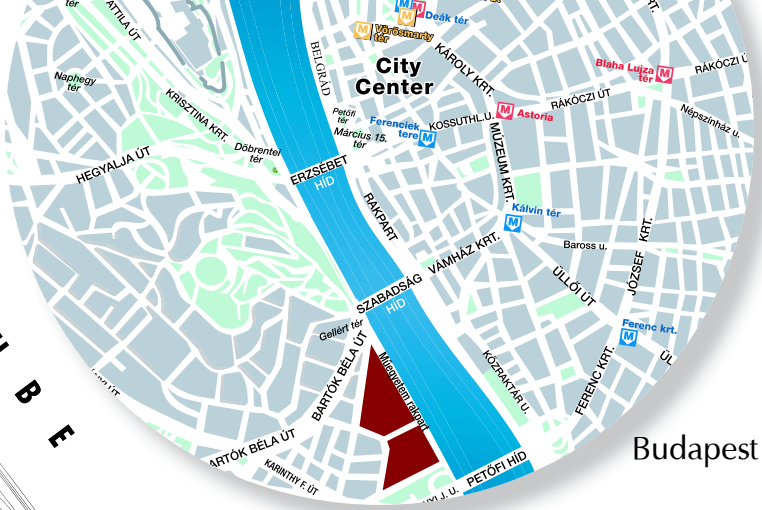
Engineering Geology of Hungary

BMEEOGMMG64

The goal of the subject, that the students getting familiar with the main geological regions of Hungary and gain the required regional and local geological knowledge for engineering design and operate of facilities. Furthermore it is also an important additional part of the course to present knowledge about the main geological structures of Hungary, the location of the most important soils and rocks, the surface-forming processes with anthropogenic effects, the most important relief forms caused by flowing water, wind. Introduces to the students the karstic landforms, and the surface forming effect of mining, road, railway and other civil engineering constructions. Furthermore the subject give comparison between the Hungarian and well-known international geological units and landforms. (3 credits)

Szabadság Bridge

CH
U K
Kö
MM
Fa F
L Hő MT EL Z
AE D TR
DCS R
St T
J H
E
G
V1 V2
A

DANUBE

Budapest

City Center

Petőfi Bridge

Q
I

Infopark

Lágymányosi Bridge

Administration Block A
Fluid Mechanics Building Ae
Chemistry Building Ch
Mechanical Engineering Building D
Building Construction Laboratory El
Physics Building F
Production Engineering Building G
Informatics Buildings I, Q
Vehicle Engineering Building J
Central Building K
Central Library Kö
Hydraulic Machinery Laboratory L
Mechanics Building Mm/Mg
Mechanical Technology Building Mt
Classrooms R, T, H, E
Electrical Engineering
and Informatics
Buildings St, V1, V2
Nuclear Training Reactor TR

Office of
International Education,
Central Academic Office: R