

BULLETIN

Budapest University of Technology and Economics
2006–2007

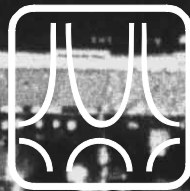
An ECTS Guide



M Ű E G Y E T E M 1 7 8 2

Engineering Programs in English
<http://www.tanok.bme.hu>

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. In the past 210 years, 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 270 engineers in 10 departments. They have contributed significantly to the scientific solution of diverse engineering problems.

Out of the approximately 1700 students, who study at this Faculty, about 90 students from abroad participate in the English language program.

The engineering programs in English follow the English-American pattern and lead to a B.Sc. degree in four years and to the M.Sc. degree in an additional two year's program. Postgraduate or Ph.D. courses are guided under individualized programs that normally take three or more years to complete.

The B.Sc. program has two minors: Civil Engineering minor and Land Surveying and Geoinformatics Engineering minor. Inside the Civil Engineering minor there are two branches: Branch of Structural Engineering and Branch of Infrastructure – Environmental Engineering. The first three semesters of the branches feature a universal, fundamental education, while in the subsequent semesters, studies divide according to the branches. Students take a block of compulsory subjects that provide fundamental education in their preferred branch of study, and in the seventh semester a block of elective subjects. The eighth semester is reserved for preparing the diploma work.

Branch Studies – Areas of Concentration

Each branch offers specific educational objectives:

- **Graduates from the Civil Engineering minor, Branch of Section of Structural Engineering** create engineering structures by utilizing and designing structural materials. They are expected to design, construct and organize the investments of mechanically, structurally and technologically complex structures in cooperation with architects and transport and hydraulics specialists. Future structural engineers who graduate from this branch will be able to design and construct, among other things, flyovers and underground passages for traffic networks; power stations, cooling towers, cranes, transmission line structures and TV towers; halls, storehouses, industrial plants, and multi-storey buildings as well as hydraulic engineering and water supply structures.
- **Graduates from the Civil Engineering minor, Branch of Infrastructure – Environmental Engineering**, gain detailed knowledge of road, motorway and airfield construction; railway and metropolitan rail-road construction; urban transport; and road traffic. Because the construction and foundations of buildings, bridges, hydraulic engineering and other structures require knowledge of geotechnics (soil mechanics, earthwork, foundations and underground structures), they also study these areas. The principal subjects of this branch essentially focus on design, but the students also learn about related technological, constructional and operational problems. In addition, they become proficient in using methods of laboratory testing and of research and development, which are incorporated in the main specialized subjects. Students possess knowledge in hydrology, hydraulics, hydraulic engineering and water management and so are qualified in engineering design, investments, construction, operation and maintenance of hydraulic engineering structures, water supply and canalization, agricultural hydraulic engineering and water management. They also possess a working knowledge of subjects as flood protection, river regulation, foundations, reinforced concrete and steel structures for hydraulic structures, water supplies for residential areas and industrial establishments, the technical-economic aspects of hygienic and public services (drainage, irrigation, sewage treatment and utilization), the design, construction and operation of hydraulic engineering structures and also environmental engineering.
- **Graduates from the Land Surveying and Geoinformatics minor** can spatially locate and map natural and artificial configurations, set out designed engineering structures, determine deformations of erected constructions, develop control point networks, perform astronomical and gravitational measurements and determine the Earth's geodynamical processes. Graduates in surveying engineering can design and manage economic solutions for geodesic problems at a high engineering level. They can also develop relevant technologies and perform significant scientific research.



Erasmus Mundus Master Course: EURO-Aquae

EURO-Aquae: Euro Hydro Informatics and Water Management. The Master Course is supported by the European Commission Directorate General for Education and Culture through the actions 1 & 2 of the Erasmus Mundus framework. The partner universities issue the academic degree MSc. (Master of Science) according to local situations. The degrees are recognized by all participating countries. The consortium tries to establish a joint european degree "Master of Science in Hydro-Informatics & Water Management".

Departments

Building Construction
 Building Materials and Engineering Geology,
 Geodesy and Surveying,
 Geotechnics
 Highway and Railway Engineering
 Hydraulic and Water Resources Engineering,
 Photogrammetry and Geoinformatics,
 Sanitary and Environmental Engineering,
 Structural Engineering,
 Structural Mechanics.

Budapest University of Technology and Economics Faculty of Civil Engineering

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 Vice-Dean of the Faculty: Dr. József Farkas
 Course Director: Dr. Lajos Kisgyörgy
 Program Co-ordinator: Mrs. Ildikó Lente*

Curriculum of B.Sc. Subjects Civil Engineering General Courses

Subject			Working hours / semester								Requisites
Name	Code	Credits	1	2	3	4	5	6	7	8	
English Language I	BMETKGTB101	2	2/2/e/4								
English Language II	BMETKGTB201	2	2/2/e/4								
Mathematics A1a	BMETE90AX00	6	4/2/e/6								
Mathematics A2a	BMETE90AX02	5	4/2/e/6								Mat1
C.E. Mathematics A3	BMETE90AX07	5			2/2/e/4						Mat2
C.E. Physics	BMETE13AX00	3	2/1/t/3								
Civil Eng. Representation and Drawing	BMEEOMEAT01	4	2/2/t/4								
Chemistry of Construction Materials	BMEEOEMAT02	2	2/0/t/2								
Statics	BMEEOTMAT03	6	2/3/e/6								
Strength of Materials	BMEEOTMAT04	6	3/2/e/6								Mat1, AT03
Dynamics	BMEEOTMAT05	3			2/1/e/3						AT04
Technical Informatics	BMEEOFAT06	2	1/1/t/2								
Basics of Computer Science	BMEEOFAT07	4	2/2/t/4								AT06
Surveying I.	BMEEOAFAT08	4	1/3/t/4								
Surveying II.	BMEEOAFAT09	3	1/2/e/3								AT08
Introduction to Geoinformatics	BMEEOFAT10	3			2/1/t/3						AT07, AT09
Geology	BMEEOEMAT11	3	1/2/e/3								
Building Materials I.	BMEEOEMAT12	3	1/2/t/3								AT02
Soil Mechanics	BMEEOGTAT13	4			2/2/e/4						AT04, AT11
Earthworks	BMEEOGTAT14	3				2/1/e/3					AT13
Foundation Engineering	BMEEOGTAT15	4					2/1/e/4				AT14
Bases of Design	BMEEOHSAT16	2			2/0/t/2						AT04
Steel Structures I.	BMEEOHSAT17	3				2/1/t/3					Mat2, AT12, AT16
Reinforced Concrete Structures I.	BMEEOHSAT18	4				2/1/e/4					Mat2, AT12, AT16
Timber and Masonry Structures	BMEEOHSAT19	3			2/1/t/3						AT04, AT12
Building Construction Study	BMEEOMEAT20	3			2/1/t/3						AT01, AT12
Roads	BMEEOUVAT21	3			2/1/t/3						AT09
Railway Tracks	BMEEOUVAT22	3				2/1/e/3					AT21
Basics of Environmental Engineering	BMEEOVKAT23	2				2/0/t/2					
Public Works	BMEEOVKAT24	4			2/2/e/4						AT25, AT26
Hydrology I.	BMEEOVVAT25	3	2/1/e/3								
Hydraulics I.	BMEEOVVAT26	3		2/1/e/3							
Hydraulic Engineering, Water Management	BMEEOVVAT27	4				2/2/t/4					AT25, AT26
Micro- and Macroeconomics	BMEGT30A001	4						4/0/e/4			
Management and Enterprise	BMEGT20A001	4							4/0/t/4		
Business Law	BMEGT55A001	2				2/0/t/2					
Development of Settlements and Regions	BMEEOUVAT28	3					3/0/t/3				AT22, AT24, AT27
Theory of Administration, Real-estate Registration	BMEEOUVAT29	3							3/0/t/3		
C.E. Linguistic Communication	BMEGT	2			0/2/t/2						
Field Course of Surveying	BMEEOAFAT30	3		9n/t/3							
Industrial Practice	BMEEODHAT31	0						4weeks			
Elective subjects	BMEEO...	4								4	



Curriculum of B.Sc. Subjects Branches

Subject			Working hours / semester								Requisites
Name	Code	Credits	1	2	3	4	5	6	7	8	
Structural Engineering Branch											
Construction Management - Estimates	BMEEPEKAS01	3					1/2/t/3				AT14, AT18, AT20
Construction Management - Contracting	BMEEPEKAS02	2						1/1/e/2			AS01
Rock Mechanics	BMEEOEMAS03	2						1/1/t/2			AT11, AT19
Building Materials II.	BMEEOEMAS04	4					2/2/e/4				AT12
Structural Analysis	BMEEOTMAS05	5			2/3/e/5						Mat2, AT04
Finite Element Modelization	BMEEOTMAS06	4				1/2/t/4					AS05
Steel Structures II.	BMEEOHSAS07	4				2/1/t/4					AT17, AS05
Reinforced Concrete Structures II.	BMEEOHSAS08	4				2/2/e/4					AT18, AT19, AS06
Bridge Construction	BMEEOHSAS09	4						2/1/e/4			AS07, AS08
Constructional Technology	BMEEOHSAS10	3							1/2/t/3		AS07, AS08
Underground Structures, Deep Foundation	BMEEOGTAS11	4						3/1/t/4			AT15
Building Construction I.	BMEEOEAS12	4			2/1/t/4						AT20
Building Construction II.	BMEEOEAS13	3				2/1/e/3					AS12
Residential Building Design	BMEEOEAS14	3						1/2/t/3			AS13
Laboratory Practice of Testing of Structures and Materials	BMEEOHSAS15	3						9d/t/3			AS07, AS08
Field Course of Structure Geodesy	BMEEOAFAS16	1					3d/t/1				AT30, AS07!, AS08!
Diploma Work	BMEEO**ASDP	24								24	
Infrastructural Engineering Branch											
Building of Infrastructural Facilities	BMEEOUVAI01	3						2/0/t/3			AT27, AI05, AI08
Water and Environmental Acts	BMEEOVKAI02	2						2/0/t/2			AT23, AT27
Infrastructure geoinformatics	BMEEOFTAIO4	3			2/1/t/3						AT10
Construction for the Infrastructure	BMEEOHSAI04	6				2/3/t/6					AT17, AT18
Pavement Structures of Transport Infrastructure	BMEEOUVAI05	5				3/1/e/5					AT22
Transportation Networks	BMEEOUVAI06	3				2/1/t/3					AT22
Traffic Engineering	BMEEOUVAI07	2						2/0/t/2			AI06
Regional Public Works	BMEEOVKAI08	3			2/1/e/3						AT24
Aquatic chemistry and hydrobiology	BMEEOVKAI09	3				2/1/e/3					AT23
Urban Environmental Protection	BMEEOVKAI10	3				2/1/e/3					AT23
Water Quality Control	BMEEOVKAI11	4					2/1/e/4				AT26, AI09
Hydraulics II.	BMEEOVVAI12	3			2/1/t/3						AT26
Hydrology II.	BMEEOVVAI13	3				2/1/t/3					Mat3, AT25
Water Resources Management	BMEEOVVAI14	3					2/1/e/3				AT27
Design for the Infrastructure	BMEEOUVAI15	3						0/3/t/3			AT28, AI07, AI08
Highway and Railway Field and Laboratory Course	BMEEOUVAI16	3					6d/t/3				AI05
Hydrometric field course	BMEEOVVAI17	3					6d/t/3				AI11!, AI13
Diploma Work	BMEEO**AIDP	24								24	
Geoinformatical Engineering Branch											
Surveying management of eng. establish.	BMEEOAFAG01	2						2/0/t/2			AT20, AT22, AT30
Property valuation	BMEEOAFAG02	3							2/0/t/3		AT13, AT20
Geoinformatics	BMEEOFTAG03	3			2/1/t/3						AT10
Map projections	BMEEOAFAG04	2				2/0/t/2					Mat1, AT01, AT30
Large scale digital mapping	BMEEOAFAG05	3				2/1/t/3					AT30
Introduction to Geophysics	BMEEOAFAG06	2			2/0/t/2						Mat3
Geodetic Control Networks	BMEEOAFAG07	3				2/1/t/3					AG11
Geodesy	BMEEOAFAG08	5					4/1/e/5				AG04, AG07, AG09
Global positioning	BMEEOAFAG09	3				2/0/e/3					AG06, AG11
Engineering surveying	BMEEOAFAG10	3					1/2/t/3				AT30
Adjustment calculation	BMEEOFTAG11	4			2/1/e/4						Mat2, AT30
Photogrammetry	BMEEOFTAG12	5				3/1/e/5					AG11
Remote sensing	BMEEOFTAG13	4					2/2/e/4				AG12
Topography, cartography	BMEEOFTAG14	5				3/2/e/5					AG03
Real estate register	BMEEOAFAG15	2				2/0/t/2					AT04, AT09
Geodetic Control Networks Field Course	BMEEOAFAG16	3					6d/t/3				AG07
Field practice in geoinformatics	BMEEOFTAG17	3					6d/t/3				AG13!, AG14!
Diploma Work	BMEEO**AGDP	24								24	



Curriculum of B.Sc. Subjects Majors

Subject			Working hours / semester								Requisites
Name	Code	Credits	1	2	3	4	5	6	7	8	
1. Branch of Structural Engineering											
Major of Buildings											
Steel Buildings	BMEEOHSASA1	5					2/2/e/5				AS07
Reinforced Concrete Buildings	BMEEOHSASA2	5					2/2/e/5				AS08
Timber Structures	BMEEOHSASA3	3						2/1/h/3			AS08
Strengthening of Structures	BMEEOHSASA4	2					1/1/e/2				AS08
Composite Building Structures	BMEEOHSASA5	2					1/1/e/2				AS07
Industrial and Agricultural Building Design	BMEEOMEASA6	3							1/2/e/3		AS14
Major of Bridges and Structures											
Steel Bridges	BMEEOHSASB1	4					2/2/e/4				AS07, AS09
Reinforced Concrete Bridges	BMEEOHSASB2	4					2/2/e/4				AS08, AS09
Composite Bridges	BMEEOHSASB3	4						2/2/e/4			AS07, AS08, AS09
Engineering Works	BMEEOHSASB4	6						2/3/e/6			AS08, AS11
Timber Bridges	BMEEOHSASB5	2						1/1/e/2			AS08, AS09
Major of Geotechnics											
Geotechnics	BMEEOGTASC1	6					4/1/e/6				AS11
Tunnels	BMEEOGTASC2	3						2/1/e/3			AS11
Reinforced Concrete Engineering Works	BMEEOHSASC3	6						2/3/e/6			AS07, AS11
Watertighting and concrete technology	BMEEOEMASC4	3						3/0/e/3			AS04
Foundation geology	BMEEOEMASC5	2						1/1/e/2			AS03
Major of Building Management											
Steel Buildings	BMEEOHSASA1	5					2/2/e/5				AS07
Reinforced Concrete Buildings	BMEEOHSASA2	5					2/2/e/5				AS08
Managing Civil-Engineering Projects	BMEEPEKASD1	4						2/2/e/4			AS02
Managing Construction of Pre-fabric. Struct.	BMEEPEKASD2	3						1/2/e/3			AS02
Contracting in Construction	BMEEPEKASD3	3						2/1/e/3			AS02
2. Branch of Infrastructure Engineering											
Major of Transportation Facilities											
Highway Planning	BMEEOUVASE1	5					2/2/e/5				AI05
Railroad Planning	BMEEOUVASE2	5					2/2/e/5				AI05
Road Building and Maintenance	BMEEOUVASE3	4					3/0/e/4				AI05
Railroad Building and Maintenance	BMEEOUVASE4	3						3/0/e/3			AI05
Earthworks of Transportation Facilities	BMEEOGTASE5	3						3/0/e/3			AT15
Major of Water Engineering											
Water Damage Prevention	BMEEOVVASF1	5						2/2/e/5			AI13
Water Utilisation	BMEEOVVASF2	4					2/2/e/4				AI12
River Basin Management	BMEEOVVASF3	4					2/2/e/4				AI14
Hydroinformatics	BMEEOVVASF4	4					2/2/e/4				AI12
Water resources projects	BMEEOVVASF5	3						2/1/e/3			AT27
Major of Municipal Engineering											
Urban Transportation	BMEEOUVASG1	5					2/2/e/5				AI05
Planning of Public Networks	BMEEOVKASC2	5					1/3/e/5				AI08
Water- and Wastewater Treatment	BMEEOVKASC3	5						2/2/e/5			AI11
Town Planning	BMEEOUVASG4	3						0/3/e/3			SG1, SG2
Urban Management	BMEEOVKASC5	2						2/0/e/2			AI08
Major of Environmental Engineering											
Environmental Technologies	BMEEOVKASH1	6					4/1/e/6				AI10, AI11
Environmental Remediation	BMEEOVKASH2	4						3/1/e/4			AI10, AI11
Environmental Impact Assessment	BMEEOVKASH3	4						2/2/e/4			AI10, AI11
Waste management	BMEEOVKASH4	3						2/1/e/3			AI10
Protection of constructions	BMEEOEMASH5	3						3/0/e/3			AT12, AI10
3. Branch of Geoinformatic Engineering											
Major of Geodesy											
Engineering Surveying II.	BMEEOAFAS1	4					2/2/e/4				AT30
Surveying for engineering planning	BMEEOAFAS2	4						2/2/e/4			AT30
Mine Surveying	BMEEOAFAS3	3						1/2/e/3			AT30
Utilities and registers	BMEEOAFAS4	3						2/1/e/3			AT24, AT30
Quality management in industrial surveying	BMEEOAFAS5	3						2/1/e/3			AT30
Engineering photogrammetry	BMEEOFTAS16	3						2/1/h/3			AG12
Major of Geoinformatics											
Geoinformatical analyses	BMEEOFTAS1	4					2/2/e/4				AG03
Geoinformatical database systems	BMEEOFTAS2	4						2/2/e/4			AG03
Topographical databases	BMEEOFTAS3	3						2/1/e/3			AG14, AG17
Environment and remote sensing	BMEEOFTAS4	3						2/1/e/3			AG13
Digital image analysis	BMEEOFTAS5	3						2/1/e/3			AG03, AG12
Cadastral informatics	BMEEOAFAS16	3						2/1/h/3			AG03

Curriculum of M.Sc. Subjects Civil Engineering Minor

Subject			Working hours / semester				Requisites
Name	Code	Credits	1	2	3	4	
Branch of Structural Engineering (MS)							
Steel Buildings	BMETKEOHM01	7	4/2/e/7				HB03
Reinforced Concrete Buildings	BMETKEOHM02	7	4/2/e/7				HB04
Analysis of Buildings	BMETKEOTM01	6	3/2/e/6				TB06
Timber Structures	BMETKEOHM03	4		2/2/e/4			HB04
Steel and Composite Bridges	BMETKEOHM04	8	4/3/e/8				HB03, HB05
Concrete Bridges and Civil Engineering Work	BMETKEOHM05	8		4/3/e/8			HB04, HB05
Analysis of Bridges and Engineering Structures	BMETKEOTM02	6		3/2/e/6			TB06
Advanced Foundation	BMETKEOGM01	9		4/4/e/6			GB03
Design of Civil Engineering Works	BMETKEOHM06	6			3/2/e/6		HB04
Concrete Technology and Insulations	BMETKEOEM01	4			2/2/e/4		EB02
Design of Communal Buildings	BMETKEOMM01	4			2/2/e/4		MB02
Management of Engineering Projects	BMETKEPEM01	5			3/2/e/5		EKEB03
Elective Subject	BMETKEO...	7				x	
Diploma Work	BMETKEO.M..	30					x
Branch of Infrastructure and Environmental Engineering (MI)							
Highway Planning	BMETKEOUM01	7	4/2/e/7				UB04
Railroad Planning	BMETKEOUM02	7		4/2/e/7			UB04
Informatics in Transportation	BMETKEOUM03	3			0/3/e/3		UB02
Environmental Protection in Transportation	BMETKEOUM04	2			2/0/e/2		VB01, UB04
Flood Control and Drainage	BMETKEOWM01	7	4/2/e/7				WB07
Water Use	BMETKEOWM02	7		4/2/e/7			WB06
Water Resources Project Planning	BMETKEOWM03	2			1/1/e/2		WB04
Design of Public Works	BMETKEOVM01	7	4/2/e/7				VB02
Urban Transport Planning	BMETKEOUM05	7		4/2/e/7			UB02
Complex City Planning	BMETKEOUM06	4			0/4/t/4		VM01, UM05
Environmental Planning	BMETKEOVM04	9	4/4/e/9				VB04
Urban Environmental Protection	BMETKEOVM05	6		3/2/e/6			VB04
Sanitary Engineering	BMETKEOVM06	6			3/2/e/6		VB01, GB02
Elective Subject	BMETKEO...	7				x	
Diploma Work	BMETKEO.M..	30					x
Land Surveying and Geoinformatics Minor (MG)							
Construction Guidance, Deformation Analysis	BMETKEOAM01	7	4/2/e/7				AB03
Engineering Surveying	BMETKEOAM02	8	4/3/e/8				AB03
Underground Surveying	BMETKEOAM03	6		3/2/e/6			AB03
Engineering Photogrammetry	BMETKEOFM01	3		1/2/e/3			FB06
Public Works and their Record	BMETKEOAM04	3			2/1/e/3		AB02
Geoinformation Analysis	BMETKEOFM03	8	4/3/e/8				FB04
Geoinformational Data Structures	BMETKEOFM04	7		4/2/e/7			FB04
Cadastral Surveying	BMETKEOFM05	5		3/2/e/5			FB04
Topographical and Cartographical Data Bases	BMETKEOFM06	4			2/2/e/4		B04, FB08
Environment and Remote Sensing	BMETKEOFM07	3			2/1/e/3		B04, FB07
Digital Image Processing	BMETKEOFM08	3			2/1/e/3		FB04
Physical Geodesy	BMETKEOAM07	7	4/2/e/7				AB09
GPS and Internal Positioning	BMETKEOAM08	7		4/2/e/7			AB05
Geodetic Astronomy	BMETKEOAM09	3			2/1/e/3		
Elective Subject	BMETKEO...	7				x	
Diploma Work	BMETKEO.M..	30					x

Elective subjects:

Branch of Structural Engineering (MS) UM03, UM04, WM03, VM01, UM05, VM06, AM01, AM02, AM03, AM04, AM09

Branch of Infrastructure and Environmental Engineering (MI) AM01, AM02, AM03, AM04, AM09

Land Surveying and Geoinformatics Minor (MG) UM03, UM04, WM03, VM01, UM05, VM06



Description of Civil Engineering General Courses (B.Sc. Subjects)

Mathematics A1a

BMETE90AX00

Dr. Béla Barabás

Sets: elementary operations on sets. Real numbers and coordinate planes: equations, inequalities, absolute value, lines and circles. Basic definitions and formulas in trigonometry. Functions: operations on functions, graph of a function, limit of a function and continuity. Differentiation: the derivative, rules of differentiation, derivatives of rational and trigonometric functions and implicit differentiation. Application of differentiation: relative and absolute extreme values, Rolle's and Lagrange's theorems, L'Hospital's rule, increase, decrease, concavity, convexity, asymptotes and graphing problems. (6 hours/6 credits)

Mathematics A2a

BMETE90AX02

Dr. Béla Barabás

Integration: indefinite integral, Riemann integral, 1st and 2nd fundamental theorems of calculus, mean value theorem. Application of the definite integral: area, volume and surface area generated by the revolution of the arc of a curve. Logarithmic, exponential and hyperbolic functions: natural logarithm, the number e , exponential functions, arbitrary bases and exponents and hyperbolic functions. Inverse functions: derivative of the inverse, inverse trigonometric functions and inverse hyperbolic functions. Techniques of integration: integration by parts, the integration of products of sines and cosines, trigonometric and hyperbolic substitutions, the integration of rational functions and integrals reducible to that of rational functions. Improper integrals. Systems of linear equations: Gauss and Gauss-Jordan methods. Matrices: the arithmetic of matrices, calculation of the inverse by row operations. Determinants: elementary properties and Cramer's rule. Vectors: the arithmetic of vectors, dot and cross products and the geometry of 2- and 3-dimensional spaces. Complex numbers: elementary operations on complex numbers; trigonometric and exponential forms. (6 hours/6 credits)

C.E. Mathematics A3

BMETE90AX07

Dr. Béla Barabás

Curves in 2 and 3 dimensions, parametric equations, tangent vector and arc length as parameters. Functions of two and three variables, limit, continuity, differentiability, partial derivatives, tangent plane of surfaces, extrema, multiple integrals, volume of solids, area of surfaces, and transformations of multiple integrals. Vector fields, independence, bases, dimension, linear transformations, eigenvalues and eigenvectors. Differential equations, classification of differential equations, classical methods of solving some ordinary differential equations of the first and second order. (4 hours/4 credits)

C.E. Physics

BMETE13AX00

Dr. Pál Pachter

Equation of motion. Conservation of mechanical energy. Mechanics of point systems. Center of mass. Conservation of linear momentum. Conservation of angular momentum. Accelerated frames of reference. Inertial forces. Elements of fluid mechanics. Oscillatory motion: harmonic oscillations, superposition of oscillations, damped oscillations and forced oscillations. Electrostatics. Coulomb's law. Gauss' law. Electrostatic potential. Capacitors. Dielectrics and electric currents. Ohm's law. Resistors. Kirchhoff's laws. The magnetic field of an electric current. Ampere's law. Biot-Savart law. Time-dependent fields. Faraday's induction law. Magnetism in materials. Maxwell's equations. Waves, interference and the Doppler effect. Electromagnetic waves. Kinetic theory of gases. The ideal gas. Changes of state. Laws of thermodynamics. Entropy. (3 hours/3 credits)

Civil Engineering Representation and Drawing

BMEEOMAT01

Dénes Patonai

Classification of projection methods. Multiview orthogonal projection, use of picture planes. Fitting, joining and intersecting problems. Successive auxiliary views. Defining true shape of objects. Defining and projecting of polyhedrons. Affinity and collineation. Section of polyhedrons, operations in solid geometry. Axonometrical systems, orthogonal and oblique projection. Topographic map. Generating and describing curved surfaces. Generating and describing warped surfaces. Basics of technical drawings, common system of notations, symbol of materials. Role of the human body in determining dimensions. Concept and technical content of groundplan and section. Elevation. Free-hand sketches of constructions, renders. (4 hours/4 credits)

Chemistry of Construction Materials

BMEEOEMAT02

Dr. Ákos Török

Basics of chemistry: atomic structure and chemical bonding. General properties of gases, liquids and solids. Solutions. Phase diagrams. Types and rate of chemical reactions. Chemical equilibrium. Acids, bases and salts, pH. Hydrolyses of salts. Electrochemistry. Chemistry of construction materials: cement, lime, gypsum, ceramics, metals and polymers. Corrosion of cement. (2 hours/2 credits)

Statics

BMEEOTMAT03

Dr. Tibor Tarnai, Flórián Kovács

Kinematics of particles. Position, velocity and acceleration. Motion on a known path. Kinetics of particles. Newton's second law and its application. Motion on a circular path. Energy and momentum methods for particles. Potential energy. Conservation of energy. Kinematics of rigid bodies. Equations of motion for a rigid body. Energy and momentum methods for rigid bodies. Introduction to mechanical vibrations. Free and forced vibration of particles. Damped vibrations. (3 hours/3 credits)

Strength of Materials

BMEEOTMAT04

Dr. Márta Kurutz, Dr. Imre Bojtár

Moment of inertia, principal axes. Mechanical classification of materials. Stresses and strains. Elastic-plastic materials. Stresses of beams, design and check. Centric tension/compression, simple shear, torsion, symmetrical/unsymmetrical bending, bending and shear, bending and tension/compression. Plane stress state, principal stresses. Principle of virtual displacements and forces. Principle of potential and complementary energy. Deflection of beams by the moment-area method and by work principle. Euler-buckling of elastic columns. (5 hours/6 credits)

Dynamics

BMEEOTMAT05

Dr. Márta Kurutz, Dr. Imre Bojtár

Kinematics of particles. Plane motion of rigid bodies. Newton's second law of motion. Application of principle of impulse and principle of work and energy for analysis of motion on a given motion curves. Kinetics of rigid body in case of plane motion. Direct central impact of moving mass and elastic structure. Free and forced vibration of one degree of freedom and several degree of freedom systems. Vibration forced by general type of force and by support motion. Vibration from earthquake. (3 hours/3 credits)

Technical Informatics

BMEEOFTAT06

Dr. Béla Paláncz

Introduction in the computer graphics (basic definitions, hardware and software tools). Modelling graphical objects. Geometrical transformations. Databases (data modelling, SQL software). Computer networks (computer network architectures, topology of networks, connection between local networks, different type of protocols, Addressing classes. Windows, Novell, Internet. (2 hours/2 credits)

Basics of Computer Science

BMEEOFTAT07

Dr. Béla Paláncz

What is informatics? Types and features of algorithms (efficiency, effectivity and complexity). Data types. Standard algorithms. Methods of algorithm and program design (top down, modularity, recursion, divide and solve, parallel evaluation). Iteration and recursion. Data structures (records, lists, stacks, queues, graphs and trees). Manipulation of text and binary files. (4 hours/4 credits)

Surveying I.

BMEEOAFAT08

Dr. Edit Szesztai

Fundamentals of positioning and map projections. National grid reference system, geodetic control network. Evaluation of measurement precision, propagation of error. Measurement of horizontal angles. Parts of the theodolite and its use for observations. Measurement of lengths, electronic distance measurement. Determination of heights: leveling and trigonometrical heighting. Global positioning system. (3 hours/4 credits)

Surveying II.

BMEEOAFAT09

Dr. Edit Szesztai

Computations in map projection's plane, basic relations in polar and rectangular coordinates, and orientation proce-

dures. Traversing, vertical traverse and node. Densification of control network using GPS technique. Detail survey, chain and radiation. Electronic total stations. Instruments and procedures of mapping. Setting out buildings and structures. Measurement of deformations and settlements. Survey of buildings and facilities. (3 hours/3 credits)

Introduction to Geoinformatics

BMEEOFTAT10

Dr. Ákos Detrekői

Basics of geographic information systems. Application of GIS in technical and civil engineering practice. The concept of information systems. The role of location-based information. Information systems components and application. Process of data modelling. Geometric data reference systems. Data sources and data collection methods. Technical background of GIS systems, their operational development perspectives, and their realization problems. (3 hours/3 credits)

Geology

BMEEOEMAT11

Dr. Ákos Török

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 hours/3 credits)

Building Materials I.

BMEEOEMAT12

Tamás Simon

Physical and hydrotechnical characteristics of most important structural materials: stress, strength, deformation, fatigue, creep, shrinkage, toughness, relaxation, brittleness, hardness. Binding materials. Lime, gypsum, cements, clinkers, hydration. Concrete. Aggregates, admixtures, fresh concrete, consistency, mix design, strength evaluation. Metals, iron, steel yield strength, tensile strength, ultimate strain, influence of temperature, weldability, steel corrosion, normal potential. Timber. Mechanical properties, shrinkage, swelling. Bricks. (3 hours/3 credits)

Soil Mechanics

BMEEOGTAT13

Balázs Móczár

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 hours/4 credits)

Earthworks

BMEEOGTAT14

Balázs Móczár

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, execution-



al and monitoring questions of construction. Dewatering of earth works. Geosynthetics. (3 hours/3 credits)

Foundation Engineering

BMEEOGTAT15

Dr. Géza Petrasovits

Foundation Types. Design of rigid and flexible shallow 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. (3 hours/4 credits)

Bases of Design

BMEEOHSAT16

Dr. Antal Lovas

Basic of design and actions on structures. Mechanical modelling of materials, loads and structures. Principles and requirements for safety and durability of structures; serviceability and ultimate limit states. Standardised design methods. Eurocode 1 and the National Application Documents. Densities, self-weight and imposed loads. Snow and wind loads. Thermal actions. Actions on structures exposed to fire. Loads and deformations imposed during execution. Accidental actions. Design background of highway and railway bridges. (2 hours/2 credits)

Steel Structures I.

BMEEOHSAT17

Dr. Béla Veroczi

Steel material and products. Structural elements: classification, arrangement, behaviour, limit states, design method: tension and compression members, beam. Mechanical and welded connections: classification, technology, application. Bolts and welds: behaviour, limit states, design method. Simple steel structures: arrangement, application, design: truss beams, hot-rolled beams, battened compression member. Complex steel structures: classification, application, constructional aspects. (3 hours/3 credits)

Reinforced Concrete Structures I.

BMEEOHSAT18

Dr. Zsolt Huszár

The fundamental theory of reinforced concrete structures's design. Mechanical properties of concrete, of steel bars and of prestressing tendons, bond conditions. The design of reinforced concrete and prestressing reinforced concrete cross-sections for axial and tangential loading (effects of tension, compression, bending and torsion). Rules and applications of detailing provisions. The reinforcement of bent beams. (3 hours/4 credits)

Timber and Masonry Structures

BMEEOHSAT19

Dr. Bertalan Szabó

Strength and material characteristics of wood. Basic design methods for members of traditional timber structures. Design of wooden connections for shear, tension and compression. Types and strength characteristics of masonry. Non-reinforced and reinforced walls. Design method according to EC6. Mixed (stone and brick) walls. Design and valuation of load-bearing stone structures. (3 hours/3 credits)

Building Construction Study

BMEEOMEAT20

Pál Csanády, Péter Tóth

Subject of building construction science. Effects on buildings, requirements. Building with load bearing walls and frame skeleton. Floor, stairs. Foundation and under grade insulation. Flat roof. Pitched roof: roof truss and roofing. Door (external and internal), window. Floor finish, façade finish (envelope). Practical building physics. Basics of building services engineering. Auxiliary structures of construction. (3 hours/3 credits)

Roads

BMEEOUVAT21

Dr. Lajos Kisgyörgy

Characteristics of road transportation. Road networks, categories. Vehicle proceeding in straight and circular sections. Speeds, impedances. Sight distances. Horizontal and vertical alignment, harmonization. Rural and urban intersections, sizing. Multi-level intersections. Implementing of roads. Planning phases. Materials of road structures. Flexible and inflexible road structures. (3 hours/3 credits)

Railway Tracks

BMEEOUVAT22

Nándor Liegner

Development of railway transportation. Railway definitions. Railway impedances, kinematics. Aligning and regulation of arcs. Horizontal and vertical alignment, harmonization. Railway superstructure: sizing, stresses, railroading. Structures and geometry of track geometries. Railway stations. Development of railways, the European railway network. (3 hours/3 credits)

Basics of Environmental Engineering

BMEEOVKAT23

Dr. Kálmán Buzás

Basic knowledge of ecology and environmental protection, ecology of populations and biocoenoses, nutrient cycles, ecological and environmental impacts of human activities, environmental economy, environmental impacts of engineering activities (water, air, soil contamination), basics of environmental planning. (2 hours/2 credits)

Public Works

BMEEOVKAT24

Dr. Péter Darabos

Basics of public work systems and their planning: drinking water supply and treatment, sanitary sewer systems and urban drainage, waste water treatment, centralized heating systems, energy and telecommunication networks. Information systems of public works. Public works reconstruction. Planning practice. (4 hours/4 credits)

Hydrology I.

BMEEOVVAT25

Dr. János Józsa

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

Hydraulics I.

BMEEOVVAT26

Dr. János Józsa

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 sub-surface waters and their principles. Characterisation of groundwater regime. (3 hours/3 credits)

Hydraulic Engineering, Water Management

BMEEOVVAT27

Dr. István Ijjas

The tasks, methods and tools of water management. Hungarian 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. Characteristic environmental impacts of hydraulic engineering structures. During the practical lessons four design works will be elaborated. (4 hours/4 credits)

Micro- and Macroeconomics

BMEE30A001

(4 hours/4 credits)

Management and Enterprise

BMEGT20A001

(4 hours/4 credits)

Business Law

BMEGT55A001

(2 hours/2 credits)

Development of Settlements and Regions

BMEEOUVAT28

Dr. Csaba Orosz

Basic concepts. Historical antecedents. Relationships among urbanistical, transportation planning and communal work affairs. Administration and legalisation environment in Europe and Hungary. Examples, case studies, basic literature. Prosperous and recessionary settlements, regions Land-use Planning. Infrastructural frames. Public works, railway networks, road networks. Requirements and characteristics of balanced development. (3 hours/3 credits)

Theory of Administration, Real-estate Registration

BMEEOUVAT29

Dr. Csaba Orosz

(3 hours/3 credits)

C.E. Linguistic Communication

BMEGT

(2 hours/2 credits)

Surveying Field Course

BMEEOFAT30

Dr. Edit Szesztai

There is a complex surveying work. It is connected with engineering. The students evaluate of given situation, specify the necessary surveyor works and methods. They practice the required measurement-, computation-, planing-, setting out-, and documentation works. They carried out Control Station-, detail-, engineering establishment measurements to determine point positions, including setting out works, pegging of batter boards and deformation measurements etc. They will be familiar with modern instruments and methods (GPS total stations, laser). (9 days/3 credits)

Labor Safety

BMEEODHAT32

Dr. Zoltán Vattai

Basic terms of labour safety. Legal and technical environment. Obligations and regulations. Hazards and typical accidents. Preventing accidents. Recognizing and avoiding hazards. Technical and managerial tools. Training and supervision. What to do in any case of accidents. Cost consequences of accidents. (1 hours/0 credit)



Description of B.Sc. Subjects

Branch of Structural Engineering

Construction Management - Estimates

BMEEPEKAS01

Dr. Zoltán Vattai, Dr. Ferenc Tóth

Social- and economic environment of Construction. Parties and stakeholders of construction projects, their cooperations. Break-down structures of construction projects (WBS,RBS,OBS). Basics of process composition and process analysis. Characteristic human-, material- and technical resources. Construction equipments, main technologies. Works and standards. Basics of cost- and time estimates. Schedules and other on-site documents. Site management. (3 hours/3 credits)

Construction Management - Contracting

BMEEPEKAS02

Dr. Zoltán Vattai

Pricing and logistics survey. Cost analysis, engineer's price, bid. Investment and contracting. Public procurement. Up-to-date project planning and monitoring methods. Networking techniques and project models (PERTtime, CPMtime, CPMcost, MPM/PDmtime). Technology oriented project models. Basics of Engineering Economics. Financing construction projects. (2 hours/2 credits)

Rock Mechanics

BMEEOEMAS03

Dr. Ákos Török

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. (2 hours/2 credits)

Building Materials II.

BMEEOEMAS04

Tamás Simon

Plastics. Types, aging, influence of heat, chemical resistance, fibre reinforced polymers. Ceramics. bricks, blocks, hydrotechnical properties, frost resistance. Glass. Physical and chemical properties. Watertighting, heat and sound insulating materials. Concretes. (light and heavy weight concretes, fibre reinforced concrete, porous concrete), cement content, w/c, steam curing, freeze-thaw resistance, water permeability. Iron and steel. Production, phase diagrams, martensit, heat treatments, corrosion protection, Pourbaix diagram. Paints. (4 hours/4 credits)

Structural Analysis

BMEEOTMAS05

Dr. Katalin Bagi, Dr. György Károlyi

Force and displacement influence lines of statically determinate structures. Maximal internal forces of cross sections. Diagrams of maximal internal forces. Solution of statically indeterminate plane structures by the force method, dead load, manual solution. Frames, trusses, strengthened structures and continuous beams. Solution of statically indeterminate plane structures by the displacement method, dead load, manual solution. The moment distribution method. Orthogonal plane frames, continuous beams. (5 hours/5 credits)

Finite element modelization

BMEEOTMAS06

Dr. Zolt Gáspár

Principles and solution methods of the finite element method. FEM models of different structures: frames, grids, plates, walls, shells and compound structures. Modelization of supports and connections. Computational problems: static, dynamic (seismic) analyses. Use of industrial FEM codes (NASTRAN, AXIS, FEM-DESIGN, SOFISTIK) and solution of practical problems by them. Approximative verification computations. (3 hours/4 credits)

Steel Structures II.

BMEEOHSAS07

Dr. Ferenc Papp

Brittle fracture and fatigue of steel; phenomenon and design aspects. Stability limit states of steel structural elements: flexural-torsional, lateral-torsional and plate buckling; behaviour, design method. Interaction of stability and strength phenomena in the behaviour structural elements; design methodology. Beam-to-beam and beam-to-column joints: arrangement, behaviour and design. Primary steel framed structures: constructional details, global analysis and design. (3 hours/3 credits)

Reinforced Concrete Structures II.

BMEEOHSAS08

Dr. László Varga, Dr. Péter Ódor

One and two way reinforced concrete slabs. Approximate methods for concrete slabs. Design and structural joints of concrete slabs according to EC2. Approximate methods for multi-story concrete frames. Design and structural joints of concrete frames. Bracings of buildings for lateral loads. Detailing of concrete structures according EC2. (4 hours/4 credits)

Bridge Construction

BMEEOHSAS09

Dr. Géza Tassi, Tamás Kovács

History and classification of bridges. Materials, functional and structural aspects. Design codes for highway and railway bridges. The substructure: abutments, pylons and anchors. Bearings and expansion joints. Superstructure in concrete, prestressed concrete, steel and steel-concrete composite construction. Types of superstructure: RC slab bridges, steel plate girder bridges, ribbed plated bridges, steel truss girder bridges, box girder bridges. Refurbishment of bridges. Aesthetics of bridges. The bridge and its environment. (3 hours/4 credits)



Constructional Technology

BMEEOHSAS10

Dr. Ferenc Papp

Fabrication of steel- and prefabricated reinforced concrete structures. Advanced erectional- and constructional technologies. The influence of the constructional technologies on the structures. Welding technologies (interaction of the welding method and the steel material). Construction of welded structures, design aspects. Modern connecting elements and fasteners. Selection of the steel grade. In situ, prestressed and special RC constructional technologies. Quality control, qualification, verification of the capability. (3 hours/3 credits)

Underground Structures, Deep Foundation

BMEEOGTAS11

Dr. Géza Petrasovits

Types and field of application of deep foundations (stone columns, diaphragm walls). Load transfer mechanism 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. (4 hours/4 credits)

Building Construction and Building Physics I.

BMEEOMEAS12

Pál Csanády, Péter Tóth

Primary and additional structures of buildings, protection - Part 1. (Treatments: effects ? requirements, introduction and evaluation of variations; relations to other building components.) Load bearing structures (walls, frames, floors, stairs, foundation). Protection against moist (insulation of under grade structures, waterproofing of flat roofs, waterproofing against functional water). Structures of architectural finishes (floor finish, wall finish, suspended ceiling, façade finish and composition). (3 hours/4 credits)

Building Construction and Building Physics II.

BMEEOMEAS13

Pál Csanády, Péter Tóth

Building components, protection - Part 2. (Treatments: as in Part 1). Space limiting structures (structures and roofing of pitched roof, built-in roof space, doors, windows, shading). Increased protection of buildings (thermal insulation, protection against moist, energetic design of buildings, protection against noise and fire, protection against effects harmful to health). Systems of construction and building (panels and cast wall construction, frames of reinforced concrete, steel, and wood, dry-tech construction, ready-made building). (3 hours/4 credits)

Residential Building Design

BMEEOMEAS14

László Szabó, Péter Tóth

Principle design methodology. Functional rules of residential building design. Selection of ground plan system and structure of the building. Sectinal arrangement, forming façade, shaping the mass. Providing architectural and form quality. Creative application of building construction knowledge. (3 hours/3 credits)

Laboratory Practice of Testing of Structures and Materials

BMEEOHSAS15

Dr. Péter Ódor

Illustration of steel element behaviour under various loading conditions by modelling and testing of structural details. Demonstration of the measuring process and the methods of the experimental stress analysis, presentation the application of these technics. Modern construction materials and methods of testing. General and special testing process in case of steel, concrete and timber structures. (9 days/3 credits)

Field Course of Structure Geodesy

BMEEOAFAS16

Dr. László Kis Papp

(3days/1 credit)

Diploma Work

BMEEOASDP**

Buildings Major

Steel Buildings

BMEEOHSASA1

Dr. László Dunai, Dr. László Hegedus

Introduction into the structural systems of the steel buildings (industrial halls, single and multi-storey buildings, sport halls and special structures). Design of structures applying the European Standards: structural details, load models, analysis and structural design. Design of relevant bracing systems in 3D buildings. Introduction into the computer aided design. The web-based design methodology in the structural engineering. (4 hours/5 credits)

Reinforced Concrete Buildings

BMEEOHSASA2

Dr. Rita Kiss

The speciality of reinforced concrete building, loading and effect, fundamental theories for earthquake force, the structural system of high-rise buildings, design and structural analysis of 3D frame buildings, of plates and of shearwall-systems, the structural analysis of fundaments, calculation methods and basic requirements of hall structures, design and structural analysis of reinforced concrete, prestressed reinforced concrete structural elements. (4 hours/5 credits)

Timber Structures

BMEEOHSASA3

Dr. Bertalan Szabó

Material models and strength classes of woods. Stress design of timber structures according to EC5. Design in service states (deflection, durability, fire resistance). Design for single and double shear doweled connections. Design and structural detailing for split-ring and nail-plate joints. Design and layout of glulam structures. Special timber structures: arches, frames, nailed shells and lattice structures. Comparative analysis of existing timber structures. (3 hours/3 credits)



Strengthening of Structures

BMEEOHSASA4

Dr. György Farkas

General rules and methods for diagnostic and qualification of load-bearing structures. Rules and methods for strengthening of structures. Strengthening methods for concrete, steel and timber structures. Strengthening for structural elements using shotcrete, additional prestressing force or glued CRP (or steel) lamellen. Problematics of renewal of panel buildings. (2 hours/2 credits)

Composite Building Structures

BMEEOHSASA5

Dr. László Dunai, Dr. László Hegedus, Dr. Pál Tomka

Materials of steel-concrete composite building structures. Structural arrangement and behaviour of composite floor beams. Analysis and design of simply supported and continuous composite floor beams. Composite connection: structural details, full and partial composite action. Structural arrangement and design of composite columns. Structural details, behaviour and design of composite floors with cold-formed trapezoidal sheetings. (2 hours/2 credits)

Industrial and Agricultural Building Design

BMEEOMEASA6

Zolt Balogh

Design methodology of industrial buildings. Design phases, aspects of decision. Main functional elements. Structures of industrial buildings: load bearing structure (reinforced concrete, steel and mixed frames). Space limiting structures: wall, roof (reinforced concrete, metal and mixed in material). Structures of natural illumination for halls (sky-lights, glass roofs), doors, windows. Finishing structures (floor finish, interior walls). Fire regulations. (3 hours/3 credits)

Bridges and Structures Major

Steel Bridges

BMEEOHSASB1

Dr. László Dunai, Dr. László Hegedus, Dr. Pál Tomka

The design process of steel highway and railway bridges. Calculation models for beam bridges. The effects of torsion in highway bridges. Design of box girder bridges. The effects of the distortion of the cross-section. Design and analysis of arch bridges. Design of cable-stayed bridges. Special checks for cables. Design of suspension bridges. The interaction of cables, pylons and deck structure. Orthotropic plates and decks in main girders and floor structures. Fatigue of bridges. Design of bearings and expansion joints. (4 hours/4 credits)

Reinforced Concrete Bridges

BMEEOHSASB2

Dr. Géza Tassí, Tamás Kovács

The speciality of reinforced concrete bridges. The structural system of bridges taken into account the function and the character of the terrain. Types of reinforced concrete bridge structures. Special questions of beam, cable-stayed and arch bridges. The analysis of prestressing, precasting; traditional and modern technology. Maintenance, renovation and reinforcing of bridges. (4 hours/4credits)

Composite Bridges

BMEEOHSASB3

Dr. László Dunai, Dr. László Hegedus, Dr. Pál Tomka

Definition and interpretation of steel-concrete composite structures. Materials and properties. Time dependent behaviour of composite structures; creeping and shrinkage; the mathematical modelling of these effects. Structural arrangement of steel beam, reinforced concrete deck and composite connector. Erection methods of composite bridges. Specialities of statical analysis and solution technics. (4 hours/4 credits)

Engineering Works

BMEEOHSASB4

Dr. Zolt Huszár

Basis of the design and construction of engineering works. 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. Application of pretensioning in engineering works. (5 hours/6 credits)

Timber Bridges

BMEEOHSASB5

Dr. Bertalan Szabó

Structural systems of timber bridges. Timber bridges for temporary or permanent use. Movable structures. Bridges with beam, truss or suspended superstructures. Arch- and framebridges. Modelling of structural joints with traditional or special connections. Modelling of structural behaviour of wood-concrete connections. Structural detailing of glulam timber bridges. Loads and effects on pedestrian bridges. Maintenance, durability and fire resistance of timber bridges. Comparative analysis of existing timber bridges. (2 hours/2 credits)

Geotechnics Major

Geotechnics

BMEEOGTASC1

Dr. Géza Petrasovits

Design principles and practice of geotechnics: the typical geotechnical activities; the geotechnical categories; the loading effects; the limit states; soil sampling and laboratory testing. Soilstatics: principles of geotechnical modelling; Shear strength of granular and cohesional soils; small and medium retaining structures and their loadings; Stability of soil bodies. (5 hours/6 credits)

Tunnels

BMEEOGTASC2

Dr. Géza Petrasovits

Tunnel types constructed by closed methods Public works tunnels. Pipe Jacking. Highway, Railway, Subway tunnels. Determination of Rock pressures. Design of cross section and longitudinal profile of tunnels. Calculation of tunnel lining. Mining and shield construction of tunnel methods in rock and in soft soils. Austrian, German, Belgian mining methods. Traditional and mechanical Shields. Insulation of tunnels. Surface subsidence associated with tunneling. (3 hours/3 credits)



Reinforced Concrete Engineering Works

BMEEOHSASC3

Dr. Zoltán Huszár

Basis of the design and construction of reinforced concrete engineering works. Technological problems of the application of insitu constructional method: water closing and insulation, thermal effects, time dependent deformations. Insitu constructional technologies. Prefabrication technology for the engineering works. Reinforced concrete foundations, base-plates, walls, pipelines - special aspects of design and construction. (5 hours/6 credits)

Watertighting and concrete technology

BMEEOEMASC4

Dr. István Zsigovics

Determination of watertighting and concrete technology. Application possibilities of cement and aggregate as well as admixtures in the concrete technology. Pumping, crack free watertight, pavement, industrial floor, shielding concrete technology. Watertighting systems in civil engineering. White-bath, modified materials in watertighting technologies. (3 hours/3 credits)

Foundation geology

BMEEOEMASC5

Dr. Ákos Török

The engineering geological data needed for the design and construction of engineering structures. The analytical methods and evaluation of geological parameters and geological material properties. The usage of geological drillings and geological sections in foundation engineering. The form and application of engineering geological regulations and standards of EC-7. Engineering geological works at foundation sties, at large subsurface openings and at different foundation types and support systems. (2 hours/2 credits)

Building Management Major

Managing Civil-Engineering Projects

BMEEPEKASD1

Dr. Zoltán Vattai

Concepts and scenarios of construction projects. Basic concepts of on-site management. Inter-relations of technical and managerial documentations. Temporary structures and supplies of construction sites. Network techniques advanced. Resource allocation, resource management. Controlling-monitoring systems. Risk and change management. Labour safety and environment protection considerations. Construction insurance. Site management technical report. Experiences of near-past civil engineering projects. (4 hours/4 credits)

Managing Construction of Pre-fabricated Structures

BMEEPEKASD2

Dr. Zoltán Vattai

Historical review, evolution of construction structures. Breaking down the structure, evolving joints. Transporting, storing and manipulating pre-fabricated units. Studying necessity and possibilities of pre-assembling. Lifting, fixing and other tools and equipments. Special considerations of site management. Orders and schedules of assembly works. Technical-technological report of assembly works. (3 hours/3 credits)

Contracting in Construction

BMEEPEKASD3

Dr. Zoltán Vattai

Enterprise formation. Processes and conditions of initiating enterprises. Technical preparation of construction. Preparing bids and/or tender documentations, methods, information systems. FIDIC. The bid. Construction contracts, contents and information systems. Documents of construction sites. Documents and procedures of hand-over. Administrating, book-keeping, accounting. The Act of Accounting. Taxation and Social Insurance. Garantee and warrantee. Terminating enterprises. Experiences and studies of construction enterprises. (3 hours/3 credits)



Description of B.Sc. Subjects

Branch of Infrastructural Engineering

Execution of Infrastructural Facilities

BMEEOUVA101

Kornél Almássy

Building processes of highways and railways. Enterprising, building and economical activity of the contractor. Warranty, guarantee. Execution and organization of earth works, sub-structures. Layout of asphalt and concrete mixing plants. Creation of asphalt and concrete. Execution and organization of substructures and pavement structures by machine chains. Execution of additional works. Computer aided building, enterprising and economical activity. Computer aided decision making methods. (2 hours/3 credits)

Water and Environmental Acts

BMEEOVKA102

Dr. Kálmán Buzás

Explanation of the Environmental and the Water acts. Related regulation of the European Union, the Environmental Acquis. The Water Framework Directive. Inland legal regulation: governmental order and decrees, in particular on the field of water and waste water service and management. Water and environmental authorities. (2 hours/2 credits)

Infrastructure geoinformatics

BMEEOFTA104

Dr. Ákos Detrekői

Strategy of creating geoinformatical systems. Analyzing methods in geometical systems. Mathematical base of analysis. Visualization in geoinformatical systems. Geoinformatical systems for facilities (transportation, telecommunication, water, sewing). Environment monitoring systems. Facility informatics. (3 hours/3 credits)

Construction for the Infrastructure

BMEEOHSA104

Dr. Antal Lovas

Analysis of continuous beams for static and moving loads. Analysis of simple plane frames by the displacement method. Structural details and design of reinforced concrete slabs. Structural arrangement and design of steel and reinforced concrete single and multi-storey frames. Reinforced concrete plate bridges, plate girder steel bridges, stiffened plate bridges, steel truss bridges, box girder bridges. Refurbishment of bridges. Reaction and internal force influence lines. Envelope diagrams. Traditional calculations of static indeterminate structures. Force- and displacement method. The basis of finite element methods and practice with FEM computer programs (plates, frames, and 3D problems) (5 hours/6 credits)

Pavement Structures of Transport Infrastructure

BMEEOUVA105

Kornél Almássy

Basic concept, definitions. Overview of history. Pavement design. Drainage and defence of earthworks. Asphalt materials. Pavement bases. Types, production and building of dense pavements. Post-compressing pavements, coatings. Concrete pavement design. Stone pavements. Road maintenance. Laboratory practice: asphalt technology, design. (4 hours/5 credits)

Transportation Networks

BMEEOUVA106

Dr. Lajos Kisgyörgy

Continental, national, regional and urban transportation networks. European transportation corridors. Intermodal and multimodal transportation, P+R systems. Logistical nodes, its role in the network. Design of transportation networks. (3 hours/3 credits)

Traffic Engineering

BMEEOUVA107

Dr. Lajos Kisgyörgy

Traffic engineering design. Quality and elements of traffic operation. Traffic operation control and management. Capacity calculations. Pedestrians and bicycles. Public Transportation. Railroads, urban rail systems. Traveller information. (2 hours/2 credits)

Regional Public Works

BMEEOVKA108

Dr. Péter Darabos

Strategic planning methodology. Mid term planning. Technical and economic optimum calculations and evaluations. Small-scale and regional (large scale) systems. Planning practice. (3 hours/3 credits)

Aquatic chemistry and hydrobiology

BMEEOVKA109

Adrienne Clement, Anita Szabó

Structure of atoms and molecules. Chemical bonds. Oxidation and reduction. Chemical processes. Dissolving of gases, liquids and solids. Acids, bases and salts. pH and buffers. Equilibrium processes. Reaction rates. Catalytic processes. Electrochemistry. Colloid systems. Transformations and interactions. Basic definitions of ecology, processes and interactions. Ecological effects on living organisms, and the hydrological cycle. The cycle of oxygen, nitrogen, carbon, sulphur and phosphorus in the hydrosphere. (3 hours/3 credits)

Urban Environmental Protection

BMEEOVKA110

Dr. Kálmán Buzás

Basic terms of water quality and classification of water quality. Quality of the surface waters and the Hungarian classification system. Water quality parameters and characteristics. Sampling and analytical methods. Case studies of representative inland water quality problems. Pollution sources and pollutant transport. Some important water quality problems: organic pollutants, eutrophication, bacteriological and toxic pollutions. Modeling of oxygen budget and eutrophication. Methods of water quality management. (3 hours/4 credits)

Water Quality Control

BMEEOVKA111

Adrienne Clement, Anita Szabó

Basic terms of water quality and classification of water quality. Quality of the surface waters and the Hungarian classification system. Water quality parameters and characteristics. Sampling and analytical methods. Case studies of representative inland water quality problems. Pollution sources and pollutant transport. Some important water quality prob-



lems: organic pollutants, eutrophication, bacteriological and toxic pollutions. Modeling of oxygen budget and eutrophication. Methods of water quality management. (3 hours/4 credits)

Hydraulics II.

BMEEOVVA112

Dr. János Józsa

Gradually varying channel flow. Hydraulic control structures, bridges, culverts. Wave theory. Shock waves in open channels and in pipes. Compound channels, floodplains, hydrodynamic features of flood waves. Hydraulics of transport phenomena: mixing, sediment transport, multiphase flows. Elements of habitat hydraulics. Lake hydrodynamics. Groundwater flow. Turbo-machines in channel or pipe networks. Hydraulic scale model laws. (3 hours/3 credits)

Hydrology II.

BMEEOVVA113

Dr. János Józsa

Elements of technical hydrology: hydrological statistics. The probability variables and main distribution functions in hydrology. Total distribution-investigation procedure. Joint investigation of probability variables. Time-series analysis, time series models. Empirical and statistical calculations of floods. Flood-routing and forecast. Fundamental ideas of water storage. Reservoir capacity curves. Calculation for water use reservoirs by mass-curve method. (3 hours/3 credits)

Water Resources Management

BMEEOVVA114

Dr. István Ijjas

Basic terms and principles of water resources management. Surface and ground water resources of the World and Hungary. Assessment of water resources. Types of water demands. Water resources planning. Protection and allocation of water resources. (3 hours/3 credits)

Design for the Infrastructure

BMEEOVVA115

Dr. Lajos Kisgyörgy

Building plan of an urban road section containing tramway tracks. Road design, traffic engineering design, public work design, dewatering. Design of the tracks. Special details. Energy supply. Authorization process. (3 hours/3 credits)

Highway and Railway Field and Laboratory Course

BMEEOVVA116

Kornél Almássy

Six days course for demonstrating and executing of work phases regarding survey and design of linear facilities. Complex task by application of traditional and modern instruments. Behaviour of the asphalt structure. Plastically hot deformation of the asphalt, statically creep and statically tensile creep test. Asphalt fatigue test, dynamic two direct bending fatigue test, dynamic one direct bending test. Asphalt material analysis test. Behaviour of the asphalt binder. Measurement of the mechanical properties of the rail fastenings: vertical and horizontal elasticity, longitudinal displacement resistance, rotational resistance, hold-down force. Assembly of rail fastenings. (6 days/3 credits)

Hydrometric field course

BMEEOVVA117

Dr. János Józsa

Measuring of free surface slope, depth and flow velocity in rivers. Discharge calculation and bed survey in river Danube and small streams by means of various methods. Water sampling methods in rivers, creeks, lakes and subsurface waters. Hydro-biological and chemical investigation and analysis. Measurements of surface-runoff and infiltration. Observation of flow phenomena in hydraulic systems and measurement of characteristic hydraulic features. (6 days/3 credits)

Diploma Work

BMEEOAIDP**

Municipal Engineering Major

Municipal Transportation

BMEEOUVASG1

Dr. Lajos Kisgyörgy, Nándor Liegner

Transportation of the city and its neighbourhood. Urban transportation networks. Pedestrians and bicycles. Road traffic and urban roads. Control and management of urban roads. Public transportation. Forms of the railway traffic (street railways, light rail transit, suburban railways, normal railways). Most important parameters of track design and construction. Track structures. Networks, timetables, vehicles, tariffs. (4 hours/5 credits)

Planning of Public Networks

BMEEOVKASG2

Dr. Péter Darabos

Planning specialties and requirements of the individual public works. Network modeling and sizing methods. Planning of drinking water supply networks. Planning of sanitary sewer and urban drainage systems. Planning of gas supply systems. Planning of complex systems. (4 hours/5 credits)

Water- and Wastewater Treatment

BMEEOVKASG3

Dr. Kálmán Búzás

Definition of drinking water. Possible water resources. Pollutants of different water resources. Disinfection. Solid-liquid phase separation. Coagulation and flocculation. Iron and manganese removal. Water softening. Removal of arsenic compounds. Membran technologies. Ozonation and activated carbon treatment. Definition of wastewater. Primary sewage treatment. Biological wastewater treatment. Chemical wastewater treatment, removal of phosphorus and nitrogen compounds. Formation treatment (aerobic, anaerobic) and disposal of sewage sludge. (4 hours/5 credits)

Town Planning

BMEEOUVASG4

Dr. Lajos Kisgyörgy

Planning of a residence area. Water supply and sewage disposition. Gas supply. Drainage, sewage, traffic engineering and environmental engineering plans of the whole area. Integrated complex design. Scenery plan for public relation. (3 hours/3 credits)



Municipal Management

BMEEOVKASG5

Dr. Péter Darabos

General conditions of the urban infrastructure management. Broad interpretation of the public utilities and public works service. Technical, economic and legal background of the urban management. Cooperation among the urban management, the planning engineer and the public works management in order to support the public works operation. Cooperation of the local and regional institutional systems (Regional Development Boards, foundations and development associations). (2 hours/2 credits)

Water Engineering Major

Water Damage Prevention

BMEEOVVASF1

Dr. János Józsa

The course deals with the methods, the design and the operation of the structures of river and lake regulation, watershed management of lowland and hilly areas, and regional recharge with special respect to risk, sensitivity of damages and economic efficiency. Beside the natural and technical-environmental characteristics, the effects of omitting the intervention will also be introduced. During the practical lessons two design works will be elaborated. (4 hours/5 credits)

Water Utilisation

BMEEOVVASF2

Dr. János Józsa

The course deals with technology, design and operation of the structures of the agricultural water use (irrigation and fisheries), the water power development, the open surface water diversion (water distribution) and inland navigation with special respect to the environmental impacts and the economic efficiency and profitability. During the practical lessons two design works will be elaborated. (4 hours/4 credits)

River Basin Management

BMEEOVVASF3

Dr. István Ijjas

The role of river basins in the history. Large river basins. Marin basins. International river basins. River basin management in the World and in Europe. River basin management planning. The new water policy and the Water Framework Directive of the European Union. River Basin Management Planning under the EU Water Framework Directive. River Basin Management case studies in the World, in Europe and in Hungary. (4 hours/4 credits)

Hydroinformatics

BMEEOVVASF4

Dr. János Józsa

Monitoring systems in water management, conception and operation. Automatic measurement instruments, methodology, data analysis and evaluation. GIS application in hydraulic engineering, data requirements, applications. Data field generation, elements of geo-statistics. Role of process modelling, surface and subsurface model modules and their use. Web-based data acquisition, hydroinformatics systems. (4 hours/4 credits)

Water resources projects

BMEEOVVASF5

Dr. István Ijjas

Water resources project identification. Criteria for identifying projects, project objectives (economic, environmental, social). Basic terms, principles, conditions and practices of project planning. Organization and financing of projects. Project assessment. Screening of alternative solutions. Project selection. Side effects of water resources projects and mitigation measures. Case studies. (3 hours/3 credits)

Transportation Facilities Major

Highway Planning

BMEEOVVASE1

Dr. Lajos Kíszyörgy

Highway planning theories and practical realization. Impedances, pulling power, kinematics of moving vehicles. Parameters and parts of horizontal alignment. Vertical alignment, harmonization. Attributes of planning of new main roads and highways. Modernization of roads. Traffic planning of road sections. Junction planning. Operation planning. Planning of road superstructures. Environmental planning. (4 hours/5 credits)

Railroad Planning

BMEEOVVASE2

Nándor Liegner

Movement geometry of the railway track. Examples of the railway movement geometry. Design of the geometry of the railway track. Stability of the railway track against buckling. Correction of distorted curves. Geometry and structural parts of turnouts. Track connections, track developments. Railway stations, classification yards. (4 hours/5 credits)

Road Building and Maintenance

BMEEOVVASE3

Kornél Almássy

Building of pavement and base courses. Special technologies. Recycling processes. Insulation systems of road bridges. Road management. Bases of Road Economics. Tols and their effects. Cost-benefit methods and their application. Bases of Road maintenance. Pavement management systems. Pavement improvement technologies. Surface coatings. Urban pavements, stone pavements. (3 hours/4 credits)

Railroad Building and Maintenance

BMEEOVVASE4

Nándor Liegner

General review of the historical development of the maintenance of the track. Hand machines, small machines and normal machinery. Technologies of track construction. Construction of slab tracks. Deterioration of the railway track and elimination of the defects. Maintenance of the substructure and the superstructure with machinery. Diagnostics of track. (3 hours/3 credits)

Earth Works for Transportation

BMEEOGTASE5

Balázs Móczár

Peculiarity of earth works for transportation. Soil exploration and soil mechanical expertations. Bearing capacity of earth works. Connection of bearing capacity and compact-

ness. Design, execution and monitoring of compaction. Methods for checking bearing capacity. Frost and thaw damages. Problems of anisthropic embankments. Soil-structures reinforced with geosynthetics. Drainage of earth works for transportation. (3 hours/3 credits)

Environmental Engineering Major

Environmental Technologies

BMEEOVKASH1

Dr. Kálmán Búzás

Air pollution. Gaseous, liquid and solid air pollutants. Sources of air pollutants. Technologies for decreasing the pollutants emission. Origin and types of wastewaters. Mechanical wastewater treatment. Biological and chemical sewage treatment. Removal of phosphorous and nitrogen compounds. Formation, treatment (aerobic, anaerobic) and disposal of sewage sludge. Origin and types of solid wastes. Hazardous wastes. Collection, treatment and disposal of solid wastes. Waste incineration. Reuse of solid wastes. Noise and vibration. (5 hours/6 credits)

Environmental Remediation

BMEEOVKASH2

Dr. Kálmán Búzás

Types of environmental pollution and methodology of the auditing. Remediation technologies (in situ and off-site methods for soil and groundwater, sediment clean-up). Elements of environmental risk assessments for selection of priority actions of remediation. Environmental fate and ecotoxicological profiles of the priority pollutants (TPH, PAH, BTEX compounds, heavy metals and pesticides.) (4 hours/4 credits)

Environmental Impact Assessment

BMEEOVKASH3

Dr. Kálmán Búzás

Structure, main elements and requirements of environmental impact assessment (EIA). Phase I and Phase II of EIA. Environmental auditing. EIA related national and international regulation. Basic tools and methods for the identification of impacts, environmental modeling. Environmental impacts of motorways, communal dump sites, waste water treatment plants and petrol stations. (4 hours/4 credits)

Waste management

BMEEOVKASH4

Dr. Kálmán Búzás

Environmental impacts of waste management. Hazardous materials, their environmental impacts, risks. Waste management: collection, treatment, disposal and reuse. Planning of waste disposal sites. Remediation. Legislation, infrastructural aspects of waste management, public relations. (3 hours/3 credits)

Protection of constructions

BMEEOMASH5

Dr. Ákos Török

Environmental influences on the construction materials, with special regard to pollution of air, ground water and soil. Transport mechanisms in porous materials (moisture, freezing, condensation and efflorescence). Deterioration processes of metals, timber and porous materials (stone, brick, mortar, concrete, etc.). Causes and possible preventions. Protection systems. Recycling strategies. Testing methods. (3 hours/3 credits)



Description of B.Sc. Subjects Branch of Geoinformatical Engineering

Surveying management of engineering establishment

BMEEOAFAG01

Dr. Gyula Graczka

Part and mission of surveying in engineering establishments institution, reconstruction, rehabilitation in preliminary design, in existing condition measurement, in final design, in authorization, in building site arrangement, in execution, in geometrical erection management, in supervision, in final approval, and in operation progress. Valuation according to engineer-professional-, legal-, organizational-, economical view points. Changing of surveying mission in consequence of requirements of engineering establishments and surveying's development. (2 hours/2 credits)

Property valuation

BMEEOAFAG02

Dr. László Kís Papp

Necessity and aim of value estimation of estates and their types. Surveying and estate registry. Structures of buildings (groundworks, bearing frames, joists, roofs, construction of openings, envelopes, faces, engineering in buildings). Diagnostics of buildings. System of public utilities. Probing of the environment. Settlements plans. Value estimation methods. Estimation of farms. Flats, contracts, duties. Validity, warranty and availability. (2 hours/3 credits)

Geoinformatics

BMEEOFTAG03

György Szabó

Definition of geoinformatics. Components and application possibilities of geoinformatics. Model building. Reference systems. Data collection methods and data sources. Hardware and software in geoinformatics. Analysing possibilities. Visualization techniques. Geoinformatics in engineering applications. (3 hours/3 credits)

Map projections

BMEEOAFAG04

Dr. Gyula Tóth

Datum and image surfaces, coordinate systems used in map projections. General considerations on map projections. Map distortions. Representation of elementary and finite figures in geodesy. Application of azimuthal and cylindrical projections of the sphere in Hungary. Transversal cylindrical projections of the spheroid. Transformations between projection systems. (2 hours/2 credits)

Large scale digital mapping

BMEEOAFAG05

Dr. József Ádám

Geometrical and technological fundamentals of digital mapping. Introduction and practical application of geodetic total stations, with data evaluation software. Develops theoretical knowledge and practical skill in digital map production. Highlights data acquisition technologies, possibilities of their applications, especially in GIS/LIS industry. Students get acquainted with digital graphic data formats, and their main properties, with feasible main procedure groups and the basics of digital cartography. (3 hours/3 credits)

Introduction to Geophysics

BMEEOAFAG06

Dr. Lajos Völgyesi

The physics of planet Earth. Earth's magnetism. Seismology and the inner structure of the Earth. Radioactivity and radiochronology. The temperature within the Earth. The Earth's gravity field and its anomalies. Time variation of the gravity field. Rotation of the Earth (general precession, polar motion). Plate tectonics and geodynamics. (2 hours/2 credits)

Geodetic Control Networks

BMEEOAFAG07

Dr. Lajos Völgyesi

Purpose and tasks of the establishment of geodetic control networks. Geodetic control networks of Hungary. Observations and computations of the triangulation networks. Calculations on the reference ellipsoids. Planning, observing and computing procedures of the primary leveling network. National gravity control networks of Hungary. Three-dimensional (3D) geodetic control networks (stellar, Doppler, GPS). Establishment of the national GPS control Network (OGPSH). Reviews of the unified European 3D geodetic bases. (3 hours/3 credits)

Geodesy

BMEEOAFAG08

Dr. József Ádám

Basic concepts of the determination of the figure of the earth. Geodetic observations and interpretation of the results. Geodetic reference systems (size, shape and orientation of the reference ellipsoid; normal gravity). Transformation of coordinates between different geodetic datums. Geometric and physical methods of determination of the geoid surface. Determination of the earth's surface, heights above the sea level. (5 hours/5 credits)

Global positioning

BMEEOAFAG09

Dr. József Ádám

Positioning by observations of extraterrestrial objects. The universe. The earth-moon system. The changes of the position and orientation of the earth in the space. Celestial and terrestrial reference systems. Time systems. Geodetic astronomy (star observations). Geodetic earth's satellites. Orbital motion of satellites. Positioning by satellites (different observation techniques). Global navigation satellite systems (GNSS). World geodetic systems, earth models. Interferometric observation of radio sources. (2 hours/3 credits)

Engineering surveying

BMEEOAFAG10

Dr. Károly Dede

The overall aim of the subject is to teach students to have a general background of the surveying practice in building industry. The course is discussing the theoretical methodology and practical aspects of industrial surveying tasks. Another aspect is to demonstrate several up-to-date surveying technologies and to have certain measurements made by the students. (3 hours/3 credits)

Adjustment calculation

BMEEOFTAG11

Dr. Ákos Detrekői

Functional and stochastic model. Error theory. Basic types of adjustment based on the least squares. Processing of changing measures (collocation based on the least squares method, filtering, interpolation). Planning of measurements. (3 hours/4 credits)

Photogrammetry

BMEEOFTAG12

Dr. Gábor Mélykúti

Geometric and physical basics of metric images. Image capture tools and methods. Methods of evaluating an image, image transformations, orthorectification. Measuring image coordinates, interior orientation. Natural and artificial spatial cognition. Theory of evaluating an image pair. Different solutions of relative and absolute orientation. Methods of 3D measurement. Photogrammetric point densification, block adjustment. Basics of digital photogrammetry. (4 hours/5 credits)

Remote sensing

BMEEOFTAG13

Dr. Othman Alhusain, Dr. Nándor Ugrin

Methods of airborne and spaceborne remote sensing, national capabilities. Outer factors on remote sensing (effects of the atmosphere, etc.) Basic questions of photointerpretation (information content of pictures, picture matching etc.), contextual, digital and analogue methods of picture interpretation. Application fields of remote sensing (environmental analysis, military applications, human fields). (4 hours/4 credits)

Topography, cartography

BMEEOFTAG14

Dr. Gábor Mélykúti

Types of maps, their properties, basics and history of topographic mapping, development of height visualization techniques, specialties of visualization by legends. Basic topics of topography, rules of the contoured visualization. Technologies of the topographic mapping. Methods of map update. Construction of thematic maps. Methods of map generalization. Map production techniques. (5 hours/5 credits)

Real estate register

BMEEOAFAG15

Erik Papp

Rudiments of real estate register in Hungary. Real estate register and cadastral registration for scot. The necessity of unified real estate register. The main units of real estate register, its contents and principles. Methods of real estate registration. The real estate registration process. The modernization of computerized land register. (2 hours/2 credits)

Geodetic Control Networks Field Course

BMEEOAFAG16

Dr. Lajos Völgyesi

Checking of instruments, determination of prism bias. setting out of traverse points, measurements at three traverse station. Geodetic control for tower measurements. Computation of first-order leveling. Static GPS measurements of the network. Computation and adjustment of new 4th order network points. Checking of the computations, compiling of specifications and transmission and evaluation of the field work. (6 days/3 credits)

Field practice in geoinformatics

BMEEOFTAG17

Atilla Juhász

The goal of the practice is to train topographic and remote sensing based data capture, the collection of geometric information. It contains a survive practice. The students train detailed the methods of surveying topography, the modern technologies of measuring digital surface model. They execute a map update task by aerial images. In thematic data collection they analyze the vegetation and the soil, architectural objects are detected. (6 days/3 credits)

Diploma Work

BMEEOAGDP**

Geodesy Major

Engineering Surveying II.

BMEEOAFAS11

Dr. Károly Dede

The subject covers the assurance methods of legal metrological regulations of constructions. It deals with the design, expectations to surveying civil engineering's, establishment problems of setting out control networks and with accuracy demands of set-out structures, settlement movement and deformation detection measurements and their design, instruments, measurement technology, data processing and evaluation as well as automation. (5 hours/6 credits)

Surveying for engineering planning

BMEEOAFAS12

Dr. Károly Dede

Nowadays digital maps and databases are involved in design and maintenance tasks. The aim of this subject to introduce the GIS tools and solutions used in engineering planning and settlement management. Case studies and practical examples supplement the lectures. (4 hours/4 credits)

Mine Surveying

BMEEOAFAS13

Dr. Gyula Graczk

The aim of subject is to teach students the design, setting out and computation of geodetic control network related to the underground constructions. The connection between surface and underground control and setting out networks is discussed as well as shaft plumbing, shaft height transfer, setting out and checking of elevator shaft and escalator tunnels. Surveying of explosion tunnel driving. Case study: Eurotunnel, inter-island tunnels in Japan. (4 hours/4 credits)

Utilities and registers

BMEEOAFAS14

Dr. Gyula Graczk

The task of the centralized utility cadaster system and its elements. Traditional and automatic register of rural utilities. The history of the water, wastewater, electric, gas and telecommunication utilities, the shape of different network topologies. Materials, dimensions and types of pipes and equipment. Instruments and technologies to find underground utilities. Surveying and mapping of utilities. Automatic mapping and facility management (AM/FM). (3 hours/3 credits)



Quality management in industrial surveying

BMEEOFAS15

Dr. Gyula Graczka

The subject deals with the tasks of quality management in industrial surveying. Gives introduction to legal regulations of quality assurance and metrology in Hungary and in European Union. Deals with methods of standardization and deployment of quality management systems. Procedures of accreditation, functionality of testing and calibration laboratories for calibration and confirmation of geodetic instruments are highlighted. Special attention turned to procedures and methods of dimensional inspection and control. (3 hours/3 credits)

Geoinformational Major

Geoinformational analyses

BMEEOFAS11

Dr. Árpád Barsi

Requirements against geoinformational analyzing systems. The algorithmic coordinate geometry and its applications. Network data structures and analysis methods in networks. Graph-based analyses. Mathematical logic and fuzzy logic in analyses. Experts systems. Terrain analysis functions. Overlay and buffer operations. Web-based analyzing environments. (4 hours/4 credits)

Geoinformational database systems

BMEEOFAS12

György Szabó

Database structures of geometrical systems, different database models, development tendency of database management systems. High and low level models of geometric and attribute data storage, theoretical basics and techniques of relational database management. Properties of the structured query language SQL, its application possibilities, storage methods of spatial data. Presenting operating database management systems through applications. (4 hours/4 credits)

Topographical databases

BMEEOFAS13

Dr. Gábor Mélykúti

Specialties of digital format topographic maps. Terrestrial, photogrammetric and cartometric technologies of making digital maps. Principal and methodological questions of digital topographic mapping. Methods of digital modeling of the terrain, application possibilities of digital surface model. Structure, application possibilities and update methods of topographic and other map databases. (3 hours/3 credits)

Environment and remote sensing

BMEEOFAS14

Dr. Othman Althusain

Creating databases concerning the environment sensing, methods of the analyses. Built-up of the database systems, physical, remote sensed and statistical methods of environment study. Local and regional studies and data collection methods. Possible tools of information capture, data sources, planning of temporal and spatial data collection, integration of data with different geometrics and information content. Practical examples for environmental processes, especially for change analysis. (3 hours/3 credits)

Digital image analysis

BMEEOFAS15

Dr. Árpád Barsi

Basic topics, tools, storage methods, formats in digital imaging. Image analyzing software. Image statistics. LUT and its operations. Convolution and non-convolution filtering. Image transformations and image corrections. Supervised and non-supervised image classification, accuracy measures. Digital photogrammetric workstations and automatic orientations. Computer based image analysis. (3 hours/3 credits)

Cadastral informatics

BMEEOFAS16

Erik Papp

Cadastral informatics deals with the content (50% theory, 50% practice), quality assurance and updating procedures of large scale surveyors basic cadastral maps, as graphic part of cadastral system. Gives introduction of data format for the Digital Basic Map (DAT). Demonstration of data updating procedures by Microstation software. Realization of map updating by special cadastral survey. Makes introduction to cadastral systems applied in Hungary. Gives basic information to start with free lance surveying enterprise. (3 hours/3 credits)



Description of M.Sc. Subjects

Branch of Structural Engineering

Steel Buildings

BMETKEOHHM01

Dr. László Dunai, Dr. László Hegedus

A detailed description of the subject can be found on the given URL and the notice board at the Department. In the frame of the subject the regulations of the EUROCODE 3 standard for steel constructions get special emphasis. The mid-semester design work (industrial frame with crane) should also be made on the basis of this standard. (6 hours/7 credits)

Reinforced Concrete Buildings

BMETKEOHHM02

Dr. Rita Kiss

General consideration of the construction system, loading and design of RC and PRC residential, public and industrial buildings. Complex design of precast industrial hall. Design and construction of high-rise buildings' bearing wall for static and dynamical loadings. (6 hours/7 credits)

Analysis of Buildings

BMETKEOTM01

Dr. József Györgyi, Dr. János Lógó

The equilibrium and compatibility equations of trusses. Force and displacement method of calculation. Analysis of space systems. Nonrigid joints. Static models of real buildings using finite element method. Geometrically nonlinear problems. Calculation of cable net. Dynamic calculation of frame structures with continuum model. Lumped and consistent mass matrix for beam elements. Proportional and external damping. Dynamic response by mode superposition method. Wind loads and dynamic response. Dynamic interaction of structures with the subsoil. Ground vibration from moving loads. Earthquake calculation of buildings. (5 hours/6 credits)

Timber Structures

BMETKEOHHM03

Dr. Bertalan Szabó

Characteristics and mechanical properties of the wood. Design philosophy of the modern timber structures, covering static and durability issues and fire-protection. Detailing of dowelled and glued connection of structural members. Design examples for timber frames, roots and large-span structures (lattice-guids, shells etc.). (4 hours/4 credits)

Steel and Composite Bridges

BMETKEOHHM04

Dr. László Dunai, Dr. László Hegedus, Dr. Pál Tomka

A detailed description of the subject and the mid-semester design works can be found on the given URL and the notice board at the Department. The subject deals with the theoretical and practical problems of the design of steel and composite bridges. It involves two design works: trussed railway bridge and composite highway bridge. (7 hours/8 credits)

Concrete Bridges and Civil Engineering Work

BMETKEOHHM05

Dr. Géza Tassi, Tamás Kovács

The subject deals with the structural arrangement of concrete highway and railway bridges, subways and flyovers, tanks, reservoirs and abutments. Main topics are the structural analysis (static and dynamic) of superstructures and foundations of civil engineering works, design based on conventional methods and by means of computer technology (CAD). Special questions are also treated such as waterproofing, draining of water, corrosion protection, reinforcing systems, aspects of concrete technology for different type of structures, arrangement of clearances for expansion and displacement joints. (7 hours/8 credits)

Analysis of Bridges and Engineering Structures

BMETKEOTM02

Dr. József Györgyi, János Dr. Lógó

Analysis of grid systems. Grid systems on the soil. Bridge grid systems. Curved beam element. Static models of bridges using finite element method. Physically nonlinear structures. Elastic-plastic calculation of frames. Moving constant force and mass point on a simply supported beam. Application of finite element method for dynamic calculation of structures. Direct integration methods for dynamic response. Calculation of vehicle-bridge interaction problem. Impact problems. Dynamic response of machine foundation. Experimental methods in dynamics. (5 hours/6 credits)

Advanced Foundation

BMETKEOGM01

Dr. Géza Petrasovits

More advanced theoretical and numerical methods of designing deep excavations and deep foundations for more complicated superstructures. Stability analysis of deep excavations. Behavior of grounded anchors and anchorage support systems. Different kinds of special piles, micropiles, and underpinning. Application of the different kinds of piles. (8 hours/9 credits)

Design of Civil Engineering Work

BMETKEOHHM06

Dr. Zsolt Huszár

Static calculation, foundation, arrangement and designing of reinforced concrete structures for the infrastructure of settlements such as tunnels, public services, pipelines, hydraulic engineering structures, dams, embankment walls, reservoirs, basins and deep-level garages. (5 hours/6 credits)

Concrete Technology and Insulations

BMETKEOEM01

Dr. István Zsigovics

Meaning and objectives of concrete technology. Relationship between technology and ethics. Influence of concrete constituents to concrete technology. Types of concrete technology, theory and practice. Practical applications for watertight concrete, industrial floor, pumped concrete, shotcrete, mass concrete and concrete against nuclear radiation. Technological descriptions. Design and control of technology. Watertightening systems. (4 hours/4 credits)



Design of Communal Buildings

BMETKEOMM01

Dr. Sándor Karácson, László Szabó

Design of communal buildings. Buildings for accommodation, office, education, trade, health, sports. Large span reinforced concrete, steel and wooden space coverings such as arch girders, plate works, shells, spatial trusses, suspended structures, air-supported constructions. Energy-based design of buildings: ecology, transparency, energy. Passive control of building climate. Energy conscious glazing systems. (4 hours/4 credits)

Management of Engineering Projects

BMETKEPEM01

Dr. Zoltán Vattai

Getting the project. Tendering. Public procurement. Contracts. Sharing risks. Responsibilities. Documents of construction projects. Understanding the structure. Choosing technology. Preparing and managing the site. Temporary structures, buildings and supplies. Supplying the site (Logistics). Labour safety. Hazards and typical accidents. Communicating Partners. Local regulations and authorities. Estimating performances. Developed network techniques. Tracking performances. Change management. Handover. Documents. (5 hours/5 credits)

Branch of Infrastructural and Environmental Engineering

Highway Planning

BMETKEOUM01

Dr. Csaba Orosz, Lajos Kisgyörgy

Highway planning theories and practical realization. Impedances, pulling power, kinematics of moving vehicles. Parameters and parts of horizontal alignment. Vertical alignment, harmonization. Attributes of planning of new main roads and highways. Modernization of roads. Traffic planning of road sections. Junction planning. Operation planning. Planning of road superstructures. Environmental planning. Costs and benefits - road economy. Airport infrastructures: runway and taxiway planning, pavement design and prescriptions. Passenger buildings and infrastructure. Hangars, cargo, catering. Environmental protection of airports. (6 hours/7 credits)

Railroad Planning

BMETKEOUM02

Nándor Liegner, Eszter Ludvig

Movement geometry of the railway track. Examples of the railway movement geometry. Design of the geometry of the railway track. Stability of the railway track against buckling. Correction of distorted curves. Geometry and structural parts of turnouts. Track connections, track developments. Railway stations, classification yards. Kinematics and kinetics of shunting. (6 hours/7 credits)

Informatics in Transportation

BMETKEOUM03

Gábor Schuchmann

Maintenance of informatics in the field of road and railway design. Types of applications (planning, design, operation), problem solving. ITS systems: data bank, data transfer, communication, data needs, existing systems. Traffic engineering: network planning, network operation, traffic counting, traffic

simulation. Applications for pavement design. Environmental applications. Railway informatics: automatic train control, automatic train operation, online train observation, automatization of classification yards, logistics, traffic controlling, design of timetable. GPS applications, examples. (3 hours/3 credits)

Environmental Protection in Transportation

BMETKEOUM04

Eszter Ludvig, Lajos Kisgyörgy

Concepts of environmental protection in case of roads and railroads. The structure and contents of environmental impact studies. Environmental planning tasks according to the prevailing Hungarian regulation. (2 hours/2 credits)

Flood Control and Drainage

BMETKEOWM01

Dr. István Ijjas

Structural and non-structural measures for flood management. Measures for reducing flood damage. Land management and flood mitigation. Flood-plain management. Economics of flood mitigation. The design of flood risks and hazards. Land drainage. Design flows for land drainage. Structural and non-structural measures for drainage systems. Design of the land drainage systems. (6 hours/7 credits)

Water Use

BMETKEOWM02

Dr. László Hayde

Besides showing the natural and environmental conditions related to hydraulic engineering activity the subject gives detailed knowledge on hydropower utilisation, reservoirs, bed storage and their structures, inland navigation, regulation and related structures. Design and dimensioning of irrigation systems. Aqua-culture, lake management also combined with natural reserve and recreation. Case studies of different countries with special emphasis on integrated methods with environmental and landscape management. Related construction technology, maintenance and operation management. In the practical part of the subject students are preparing a complex design project. (6 hours/7 credits)

Water Resources Project Planning

BMETKEOWM03

Dr. István Ijjas

Water resources project identification. Criteria for identifying projects, project objectives (economic, financial, environmental, social). Project assessment. Screening of alternative projects. Project selection. Side effects of water resources development projects and mitigation measures. Project management. River Basin Management Planning. Implementation of the EU Water Framework Directive. Case studies. (2 hours/2 credits)

Design of Public Works

BMETKEOVM01

Gergely Csanád Székely

Basic principles and practices in planning and operating water supply and the sanitary sewer system. Calculation of municipal and some industrial water demands. Functional subsystems of municipal water supply networks and their hydraulic characterization. Characteristic operating conditions and hydraulic analysis of supply systems. High-lift pump stations, storage basins and water towers. Calculations of municipal and some industrial waste water emissions. Traditional sanitary sewer systems and their design principles. Construction of sewer networks. Design principles of urban



drainage systems. Unit operations of water and waste water treatment technology. (6 hours/7 credits)

Urban Transport Planning

BMETKEOUM05

Dr. Csaba Orosz

Urban and suburban transport characteristics. Planning urban road networks and systems. Pedestrian and bicycle traffic. Traffic management and control. Public transport. Urban freight transport. Development of tramway and underground/metro services, suburban railway systems. Planning parameters of urban railway services. Urban railway superstructure design, operation management, vehicles. Trolley services. Specially operated and managed systems. (6 hours/7 credits)

Complex City Planning

BMETKEOUM06

Lajos Kisgyörgy

Planning of a residence area. Water supply and sewage disposition. Gas supply. Drainage, sewage, traffic engineering and environmental engineering plans of the whole area. Integrated complex design. Scenery plan for public relation. (4 hours/4 credits)

Sanitary Engineering

BMETKEOVM06

Dr. Kálmán Buzás

Review of environmental health problems and civil engineering activities in environmental sanitation. Emphasis is placed on the practical application of sanitary science and on the engineering theory and principles used to control environmental processes. Control of communicable and certain noninfectious diseases. Bases of environmental engineering planning and impact analysis. Drinking water catchments from surface water and ground water resources. Stream and ground water pollution and recovery and solid waste management. Air pollution and noise control. Radiation uses and protection. Recreation areas and temporary residences. Vector control. Public health service and administration. (5 hours/6 credits)

Environmental Planning

BMETKEOVM08

István Koncosos

(8 hours/9 credits)

Urban Environmental Protection

BMETKEOVM05

Dr. Kálmán Buzás

Specific environmental and public health problems associated with the quality of urban environment. Health impairments caused by the polluted environment. Aims and structures of urban environmental program regulated by the Environmental Law and the role of local governments. General characterization of the urban environment. Impacts of the human activities on the natural elements and the solutions, particularly the civil engineering methods, which are useful to cease them. Case studies conducive to synthesize the knowledge picked up in individual topics. (5 hours/6 credits)

Branch of Land Surveying and Geoinformatics

Construction Guidance, Deformation Analysis

BMETKEOAM01

Dr. Gyula Graczka

Legal documentation, and setting out land parcel for construction site. Topographic survey, earthwork computations. Setting out and control of foundations. Geometric control of earthwork construction. Electronic machine guidance. Measurement and qualification of prefabricated structure elements. Setting out concrete formworks. Geometric guidance of sliding formworks. Geodetic control of construction operations. Calibration of surveying instruments. Technical report writing and legal documentation of the new structure. Observations and their analysis for long-term stability. Deformation and settlement. (6 hours/7 credits)

Engineering Surveying

BMETKEOAM02

Dr. Károly Dede

The subject briefly reviews the survey and project, horizontal and vertical survey control and mine surveying. Setting out the first stage. The transfer of points and lines using a theodolite. Coordinate systems in engineering surveying. Tunnel Surveys. Surveying with the gyrotheodolite. (7 hours/8 credits)

Underground Surveying

BMETKEOAM03

Dr. Gyula Graczka

Surface network of underground construction. Geodetic control of shaft construction. Depth measurement. Plumbing and orientation. Orientation by two wires. The Weissbach triangles. Gyroscopic orientation. Geodetic control of tunnel construction. Mine surveying. Compasses and inclinometers. Specific requirement to topographic instruments in tunnel applications. Laser guidance and electronic control of tunnel construction machinery. Observations for surface damages caused by underground construction. Case studies of the world's largest underground constructions. (5 hours/6 credits)

Engineering Photogrammetry

BMETKEOFM01

Dr. Gábor Mélykúti, Dr. Károly Fekete

The aim of this subject is to present engineering related photogrammetric technologies that can be applied in an industrial environment. To facilitate this special and individual application of photogrammetric methodologies, it is necessary to deepen the knowledge of the theoretic basis and to know the measurement and data processing technologies from a planning point of view. The subject also covers: planning, measurement and calculation of aerial triangulation and block adjustment. Computer-based stereo compilation technologies. Ortofoto technical application. Photogrammetric data collection for terrain modelling. Civil engineering, architecture and mechanical applications of photogrammetry. (3 hours/3 credits)



Public Works and their Record

BMETKEOAM04

Dr. Gyula Graczká

Characteristics of Public Facilities. The unified facility registrar and its legal regulations. The role of central public facility registrar. Traditional and automated mapping of rural public facilities. Geometric arrangement of facilities. Possible arrangement of water supply, sewage, sewerage, gas supply, electricity, telecommunications and direct heating networks. Construction materials, dimensions, standard structures and fittings. Sample cross sections of facility constructions. Cable and pipeline locators, location technologies. Automated mapping, facility management (AM/FM), object-oriented spatial information system for AM/FM. (3 hours/3 credits)

Geoinformation Analysis

BMETKEOFM03

Dr. Árpád Barsi, György Szabó

The aim of this subject is the introduction of geoinformation analysis foundations and methods. Data analysis-, geometric-, topologic-, mathematic-, statistical-, and set methods are discussed. It presents different data analysis modules (terrain intersections, DGM, net analysis and system analysis) as well as expert system procedures. It demonstrate the analysis methods through practical examples applied in environment, network, business and telecommunication systems. (7 hours/8 credits)

Geoinformational Data Structures

BMETKEOFM04

György Szabó

Data base structures of geoinformation systems. Different data base models. Development tendencies in data base management systems. Low and high level models of geometric and descriptive data storage. Theoretical foundations and techniques of relational data base management. Characters of SQL query language, its application and geoinformation data storage methods. Practical examples of utilization of data base management systems. (6 hours/7 credits)

Cadastral Surveying

BMETKEOFM05

Erik Papp

Large scales maps, Cadastral maps and map systems, modern techniques and technologies of data collection and data processing by electronic total station and GPS, Cadastral surveying. (5 hours/5 credits)

Topographical and Cartographical Data Bases

BMETKEOFM06

Dr. Gábor Mélykúti

This subject is a continuation of the Topography subject, consequently it discusses the particulars of computer-based topographic data bases. The subject covers the following: Theory of surface modelling. Ground, fotogrammetric and cartometric technologies of data filling. Theoretic and methodic questions of digital topographic drafting. Digital terrain modelling. Implementation, maintainance and upgrade methods of topographic and cartographic data bases. (4 hours/4 credits)

Environment and Remote Sensing

BMETKEOFM07

Dr. Nándor Ugrin, Dr. Othman Alhusain

Concepts of environment related data base preparation and analysis. Data base structures. Methodologies of physical, remotely sensed, and statistical environment monitoring. Local and regional studies and data collection methods. Environment related information gaining. Environmental data sources. Time and space data collection planning. Integration of hyperspectral data. Practical examples of environmental objects and phenomena studies by the use of GIS and remote sensing methods with special attention to environmental change analysis. (3 hours/3 credits)

Digital Image Processing

BMETKEOFM08

Dr. Ákos Detrekői, Dr. Othman Alhusain

Visual perception. Digital imagery concept and modelling. Basic techniques of digital image processing. Gray level histogram. Main operations done on digital images (algebraic, logical, etc.). Transformations like F, FF, DF etc. Edge and boundary detection. Image correction, filtering, compression, classification and enhancement concepts. 2D and 3D image processing. Image interpretation and analysis. Pattern recognition concepts. (3 hours/3 credits)

Physical Geodesy

BMETKEOAM07

Dr. Lajos Völgyesi

Gravity and the representation of the Earth's gravitational potential in spherical harmonic expansion. Geodetic Reference Systems. Gravimetric and satellite methods of determining the disturbing potential. Representation of geological undulations. Densification of vertical deflections. Theory of heights. (6 hours/7 credits)

GPS and Internal Positioning

BMETKEOAM08

Dr. József Ádám

Theory and basic concepts of GPS. Types of models, solutions and processing. GPS survey design and surveying standards. Geographical positioning applications, and marine, airborne and space application of GPS. Practical aspects of GPS surveying and mapping. Use of GPS in geoid determination and in geodynamics. Differential and real-time kinematic methods and their applications. Inertial navigation systems, concepts and realization. Integration of GPS with insurance. (6 hours/7 credits)

Geodetic Astronomy

BMETKEOAM09

Dr. József Ádám

The planet Earth and its motions. Variations in celestial coordinates. International reference frame. Star catalogs and almanacs. Instrumentation of precise star observations. Precise determination of astronomic latitude, longitude and azimuth in geodetic astronomy. (3 hours/3 credits)



Description of Erasmus Mundus Master Course EURO-Aquae: Euro Hydro Informatics and Water Management

The evolution of human activities, in the foreground of climate changes and growing earth population, induces situations more and more complex to manage. The sustainable development of water resources in the aquatic environment and its management represents today a major challenge. The global aim of the management is to avoid or minimize risk of crisis as water supply, irrigation, floods, waste water treatment ... Hydro-Informatics, a European concept, emerges as the central element for the progress of modelling activities and management of capacities. The main objective of the Master is to prepare and train future scientists and executive engineers in charge of modelling and managing projects in hydro-technologies and environment. These professionals have vocation to assist local, regional, national and international collectivities, public services and to be involved in private companies.

University of Nice - Sophia Antipolis (F), Brandenburg University of Technology at Cottbus (DE), Budapest University of Technology and Economics (HU), Polytechnic University of Catalonia (ES), University of Newcastle upon Tyne (UK) are the partners of the 4 semesters master programme (2 years). Mobility scheme covers at least 3 locations.

Lectures are given mainly in English, for about 40 participants mixing European and third-country students. The master is organized in a pedagogic continuum to provide introduction and common knowledge/soft skills (sem. 1 all locations), acquisition and the use of the Hydro-Informatics concepts, methods and tools (sem. 2 UK), a thematic specialisation: hydro-informatics systems, urban waters management, inland waters management, decision support systems (sem. 3 all locations except UK) and for semester 4 (all locations), a research project or a professional practice.

The partner universities issue the academic degree MSc. (Master of Science) according to local situations. The degrees are recognized by all participating countries. The consortium tries to establish a joint european degree "Master of Science in Hydro-Informatics & Water Management".

The Master Course is supported by the European Commission Directorate General for Education and Culture through the actions 1 & 2 of the Erasmus Mundus framework.

Admission criteria: a 2nd class degree from university (Bsc) or its equivalent (min. qualification). Preferred first degree subjects are Engineering (any branch), Environmental Sciences, Physics, Computer Sciences, Geography, Mathematics, Chemistry, Geology or a similar subject. Advanced level Mathematics is required. Applicants for continuing education have to justify a professional experience as engineer or similar at least 5 years. TOEFL score of 500 or greater (or equivalent). Basic knowledge of one of the others languages (German, French, Spanish, Hungarian) used by the consortium is required. Evaluation made by the consortium on basic scientific and engineering knowledges.

More information: <http://www.euroaquae.org>

