Description of Civil Engineering BSc courses

General courses

**Compulsory English 1. (4 credits)**

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

**Surveying I. (3 credits)**


**Chemistry of Construction Materials (2 credits)**


**Civil Engineering Representation and Drawing (4 credits)**

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

**CAD for Civil Engineers (2 credits)**

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

**Geology (3 credits)**

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.
Basis of Statics and Dynamics (6 credits)  BMEEOTMAT41

Mathematics A1a - Calculus (6 credits)  BMET90AX00

Physics for Civil Engineers (2 credits)  BMETE11AX13

Compulsory English 2. (4 credits)  BMGET63A3E2
The courses are designed to enable students to communicate fluently and effectively in study environment. Receptive, productive and interactive activities and strategies are included in the curricula. By the end of the semester the overall language ability of the students is at level B2 (by the Common European Framework of Reference

Surveying II. (4 credits)  BMEEOAFAT42

Construction Materials I. (5 credits)  BMEEOEOMAT43
Civil Engineering Informatics (5 credits)  

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

Soil Mechanics (4 credits)  


Introduction to Strength of Materials (6 credits)  


Hydraulics I. (3 credits)  


Mathematics A2a - Vector Functions (6 credits)  


Surveying Field Course (3 credits)  

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

Building Construction Study (3 credits)  

Geoinformatics (3 credits)  
BMEEOFTAT43  
The aim of Geoinformatics is to introduce the principles and potential application fields of geographic information systems (GIS) in the civil engineering practice. The course discusses the basic concepts and applications of GIS, the modelling process needed to create GIS, the reference systems of geometric data, the spatial data sources and data acquisition methods, the aspects of data quality, the resources, tools, databases of GIS, the basics of data analysis, visualization and implementation of GIS. Through the lectures and labs students learn the GIS workflow based on desktop and web-based solutions, and tools of spatial process modelling, data management and web integration.

Basis of Design (3 credits)  
BMEEOHSAT41  

Structural Analysis I. (4 credits)  
BMEEOTMAT43  

Railway Tracks (3 credits)  
BMEEOUVAT41  

Basics of Environmental Engineering (3 credits)  
BMEEOVKAT41  
The aim of the course is to provide basic scientific and engineering background for further studies in environmental engineering by giving introduction to the following subjects: basics of ecology, the natural cycle of ecologically important elements and substances, the environmental effects of human activities, the ecological footprint, energy consumption patterns and energy production technologies, renewable energy sources. Selected environmental problems associated with civil engineering activities (water, air and soil pollution), with focus on the urban environment. Tools and methods for conducting environmental impact assessment.

Public Works I. (3 credits)  
BMEEOVKAT42  
The main goal of the subject is to provide information about the most important features of the public works. The subject is also including the connections between the different public works and other establishments. Further aim is to provide knowledge for the future general designers and technical managers to make the right decisions on the underground infrastructure of settlements. Main scopes are: system knowledge and design of different public work types like water acquisition, drinking water supply, waste water networks, storm water networks and public works asset management.

Hydrology I. (3 credits)  
BMEEOVVAT41  
Mathematics A3 for Civil Engineers (4 credits)

Differential geometry of curves and surfaces. Scalar and vector fields. Potential theory. Classification of
Systems of linear differential equations. The concept of probability. Discrete random variables and their
distributions. Random variables of continuous distribution. Two-dimensional distributions, correlation and
regression. Basic notions of mathematical statistics.

Earthworks (3 credits)

Scope of earth works. Plastic limit states, Rankine earth pressures. Earth pressure and passive resistance of
The design, executional and monitoring questions of construction. Dewatering of earth works. Geosynthetics.

Steel Structures (3 credits)

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

Reinforced Concrete Structures (3 credits)

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

Roads (2 credits)

History of transportation. Sustainable transportation and transportation policy. The system of tracks, vehicles
Elements of the alignment in cross sections, horizontal and vertical alignment. Basic rules and disciplines of
planning and design. Transition of superelevation. Planning process: planning, design project, construction,
operation. Traffic operation basics: measures of traffic, traffic operation and management. Intersections and
junctions. Urban transportation planning, the concept of accessibility. Characteristics, production and
Construction, management and operation of road networks. Project 1: Authorization plan of a curved section
of a secondary main road with transition curves: site plan on a contour line map with long section and cross
sections. Drainage, earthwork, road marking. Project 2: Feasibility study of a main road between two points on
a contour line map.

Hydraulic Engineering, Water Management (3 credits)

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

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

Foundation Engineering (4 credits)  

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

Micro- and Macroeconomics (4 credits)  

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

Urban and Regional Development (3 credits)  
Branch of Structural Engineering

Building Construction I. (3 credits)  BMEEOEMAS42
Students gain knowledge and skills during the semester work in the following topics: Flat and deep foundations, relation to sub-soil insulation of buildings. Masonry works, prefabricated panel systems. Plasters and ETICS. Reinforced concrete, steel and wooden beam slab constructions. Stairs. High roofs. Passable and non-passable flat roofs, green roofs. Insulations against functional water.

Timber Structures (3 credits)  BMEEOHSA44

Strength of Materials (3 credits)  BMEEOTMAS41

Construction Materials II. (3 credits)  BMEEOEMAS43

Building Construction II. (3 credits)  BMEEOEMAS43

Steel and Composite Structures (4 credits)  BMEEOHSAS41

Reinforced Concrete and Masonry Structures (4 credits)  BMEEOHSAS42
Design principles of reinforced concrete slab and frame structures, exact and approximate design methods, structural details. Bracing systems of reinforced concrete buildings, determination of the forces acting to the individual shear walls, checking of stability. Detailing of reinforced concrete structures (beam end, corbel, frame corner, curved bars, stairs, force transfer between members, expansion joints, etc.). Types and strength characteristics of masonry. Design principles of unreinforced masonry walls according to EC6. Reinforced masonry walls.
Bridges and Infrastructures (3 credits)


Laboratory Practice of Testing of Structures and Materials (2 credits)

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

Structural Analysis II. (4 credits)


Rock Mechanics (3 credits)

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.

Underground Structures, Deep Foundation (3 credits)

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.

3D constructional modelling of structures (3 credits)

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

Design of Structures Projectwork (6 credits)

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

Public Administration and Land Registry (3 credits)

Field Course of Structural Geodesy (1 credit)  
BMEEOAFAS42
The main purpose of the subject is to introduce the most modern techniques and methods for students in the field of state surveying and movement detection of civil engineering structures. The students apply the skills and knowledge learned in Surveying I, II and Field Course of Surveying to solve more complex structural engineering projects. Project area are solved by student teams. During the practices students survey some inner parts of a more levelled building, determine the geometry of axis of an about 30 m high brick chimney. Furthermore they determine the deflections of a slab and the distortions of floor. They determine the deflection of a cable bridge caused by traffic. They are introduced into the applications of photogrammetry, remote sensing and laserscanning in the area of construction engineering.

Dynamics of Structures (3 credits)  
BMEEOTMAS43

Industrial Practice (0 credits)  
BMEEODHAS42
30 days of industrial practice at a civil engineering construction company.
Major of Buildings

**Steel Buildings (5 credits)**

Analysis and design: Principles, analysis and modelling methods, global analysis of frames.

**Reinforced Concrete Buildings (5 credits)**


**Building Construction Methodology (2 credits)**

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

**Construction Technology (3 credits)**


**Building Design Projectwork (6 credits)**

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

**Elective option: Reinforced Concrete bridges (4 credits)**


**Preparatory Course for Bachelor Thesis Project (9 credits)**

The cursus aims to give a background for the student to successfully complete the requirement of the Bachelor Thesis project by obtaining the basic knowledge on the subject of the Bachelor Thesis project to prepare studies and preliminary design plans. The topic of the Preparatory Course for Bachelor Thesis project is given by the Diplomawork assignment covering the topics of both the Preparatory Course for Bachelor Thesis project and the Bachelor Thesis project. The topic is from within the domain of structural engineering in accordance with the outcome requirements, it has to be assigned by giving the possibility to continue it in the Bachelor Thesis project course.

**Bachelor Thesis Project (15 credits)**

The student should prove that he/she has acquired the knowledge and fulfilled the general requirements required by the BSc programme. The Bachelor Thesis project course establishes the frame to the special workflow for structural engineering. The subject of the Bachelor Thesis project is from within the domain of structural engineering in accordance with the outcome requirements.