University of Debrecen

Faculty of Engineering

Civil Engineering BSc Program

2024

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DEAN'S WELCOME

Welcome to UD's Faculty of Engineering!

The Faculty of Engineering of the University of Debrecen has become an outstanding centre of education and research in the Eastern Hungarian region. Following the footsteps of our predecessors, the academic and administrative staff of the Faculty work hand in hand to make our training programmes and researches meet both national and international standards.

The Faculty of Engineering is one of Hungary's most significant institutions of higher-education, and its 3000 students make it a dominant faculty of the University of Debrecen which - having the most international students, offering the most academic programmes among Hungarian universities and having been classified as a research university, the highest of qualifications - is officially listed among the best universities in the country.

We welcome the most outstanding and inquisitive students of the region with an enthusiastic and professional team of academics and researchers, and a set of laboratories unique in the country. We consciously aspire to develop the quality of education and research further, based on a close cooperation between the Faculty and the industry. Our students enter many prestigious competitions and they are becoming increasingly successful and acclaimed, while our instructors are working on a growing number of national and international projects of basic and applied research.

The Faculty bridges the gap between theory and practice and provides a high-quality theoretical background merged into practice-oriented training based on industrial relations. We do our best to maintain the high prestige of the engineering diplomas awarded by the University of Debrecen and to make sure that the knowledge and achievements of students who graduate from our Faculty continue to be recognised in the labour market.

All things considered, you are kindly advised to read this bulletin which hopefully reflects our endeavours appropriately and provides all the information you need to know about your chosen training programme. We are looking forward to supporting the personal and professional growth of our future engineers.

With the best of wishes for the years to come,

Géza Husi

Dean

HISTORY OF THE UNIVERSITY

The history of Debrecen's higher education dates back to the 16th century. The Calvinist Reformed College, established in 1538, played a central role in education, teaching in the native language and spreading Hungarian culture in the region as well as in the whole country. The College was a sound base for the Hungarian Royal University, founded in 1912. Apart from the three academic faculties (arts, law, theology) a new faculty, the Faculty of Medicine was established, and the University soon became one of the regional citadels of Hungarian higher education. Today, University of Debrecen is classified as "University of National Excellence" and offers the highest number of academic programs in the country, therefore it is considered to be one of the best universities in Hungary. Its reputation is the result of its quality training, research activities and the numerous training programs in different fields of science and engineering in English. With 14 faculties and a student body of almost 30.000, out of which about 3700 are international students, the University of Debrecen is one of the largest higher education institutions in Hungary.

The history of the Faculty of Engineering dates back to 1965, when the Technical College was established. In 1972 it was renamed Ybl Miklós Polytechnic and in 1995 it became part of Kossuth Lajos University. In 2000 the Faculty of Engineering became part of the integrated University of Debrecen.

In 2005 the Bologna System was introduced which supports the competitiveness of qualifications received at the University of Debrecen against universities all over Europe.

The Faculty of Engineering is practice-oriented and develops skills required for the current needs of the national and international labour market. The teaching staff is involved in numerous domestic and international research and design projects. The recently-opened new building wing with its ultra-modern design hosts several lecture halls, seminar rooms and laboratories equipped with the latest technology. Our students are provided with practical knowledge, training and field practice from numerous prestigious domestic and multi-national industry partners. The internship periods are excellent opportunities for students to experience how theory is put into practice at the most renowned industry representatives and become more successful in the labour market of this highly competitive sector. Students learn how to work in the working environment of multi-national companies and adapt to challenges easily. After graduation they will be able to work at a strategic decision-making level, giving priority to efficiency and engineering ethics.

The Faculty of Engineering offers a great variety of BSc, MSc courses and post-graduate training courses tailored to the needs of the rapidly changing world of engineering and focusing on European and international trends. In 2011 the Faculty of Engineering launched engineering trainings in English. In order to optimize the quality of training, the Faculty continuously strives to expand the number of industrial and educational partners at home and abroad.

The Faculty of Engineering has been a pioneer in the introduction of Quality Management System at faculty level to measure and evaluate the efficiency of its education and teaching staff in order to improve the quality of education and training from the feedback received.

The Faculty of Engineering has a vivid student life. There is a film club waiting for movie buffs and the door of the Faculty library is always open. The library is not only the host to the latest

technical books, exhibitions and tea afternoons with invited speakers, but students can also purchase theatre and concert tickets from the librarians. The Borsos József Dormitory is also a hub of activities for students.

The increasing number of international students brings cultural and ethnic diversity to the faculty.

Our aim is to aid students to become efficient members of the labour market and enrich the world of engineering in Hungary and abroad with their knowledge and expertise.

ADMINISTRATION UNITS FOR INTERNATIONAL PROGRAMMES

COORDINATING CENTER FOR INTERNATIONAL EDUCATION

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Admission Officer (for scholarship students)	Ms. Lilla Almási-Fónai Ms. Annamária Rácz
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Administrative Assistant (for scholarship students)	Ms. Nóra Dede-Kiss

The Coordinating Centre for International Education supports the international degree programmes of the University of Debrecen in giving new students information on admission and entrance exam. It has tasks in promoting and is in charge of tasks like enrolment, study contracts, modifying student status or degree programme, activating student status, modifying students' personal data, requesting and updating student cards, providing certificates for the Immigration Office (for residence permit), issuing student status letters and certificates on credit recognition, concluding health insurance contract and providing Health Insurance Card, helping students with visa process application.

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The International Office has been functioning since 2014 in order to ensure the smooth running of the international degree courses. The office is responsible for student administration (full-time students, full-time transfer students, visiting/Erasmus students), providing certificates for students, considering and accepting requests, solving problems related to course registration, giving information about internship, final exam, thesis, etc.

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Department of Building Services and Building Engineering
Department of Civil Engineering
Department of Engineering Management and Enterprise
Department of Environmental Engineering
Department of Mechanical Engineering
Department of Mechatronics
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ACADEMIC CALENDAR

General structure of the academic year:

Study period	1st week	Registration*	1 week
	2nd – 7th week	Teaching Block 1	6 weeks
	8th week	1st Drawing Week	1 week
	9th – 14th week	Teaching Block 2	6 weeks
	15th week	2nd Drawing Week	1 week
Exam period	directly after the study period	Exams	7 weeks

*Usually, registration is scheduled for the first week of September in the fall semester, and for the first week of February in the spring semester.

ACADEMIC CALENDAR OF THE FACULTY OF ENGINEERING 2023/2024

Opening ceremony of the academic year	8 September, 2024 (Sunday)
Registration week	2 – 8 September, 2024
Revision week (exams in Exam courses may be scheduled during this week)	2 – 6 September, 2024
1st semester study period in MSc and BSc programs	9 September - 13 December, 2024 (14 weeks) In case of finalist courses: 9 September - 8 November, 2024 (9 weeks)
Reporting period I (Drawing week I)	21 - 25 October, 2024 (4 working days without scheduled lessons, consultation schedule announced previously)
Conferences, Career Days	
"New Trends and Challenges in Management – Management of Global Business Processes" Conference – Event of the Mechanical Engineering Department	17 – 18 October, 2024

"Problem-based Learning in Engineering Education" Conference - organised by the Department of Basic Technical Studies	24 October, 2024
Professional exhibition and ISCAME – International Scientific Conference on Advance in Mechanical Engineering - organized by Department of Mechanical Engineering	7 – 8 November, 2024
Faculty Conference of Scientific Students' Association	22 November, 2024
Reporting period II (Drawing week II)	9-13 December, 2024 (5 working days without scheduled lessons, consultation schedule announced previously)
1st semester examination period	16 – 20 December, 2024 (1 week) 6 January – 14 February, 2025 (6 weeks) In case of finalist courses: 11 November - 13 December, 2024 (5 weeks)
Thesis (BSc, MSc) submission deadline	As defined by the departments; max. 14 days of the beginning of the final examination period.
Final examination period	As defined by the departments; at least one occasion between 16 December, 2024 and 26 January 2025.
Registration week	10 - 16 February, 2025
2nd semester study period in MSc and BSc programs	17 February - 23 May, 2025 (14 weeks) In case of finalist courses: 17 February - 8 April, 2025 (9 weeks)
Reporting period I (Drawing week I)	31 March - 4 April, 2025 (5 working days without scheduled lessons, consultation schedule announced previously)
Conferences, Career Days	
Career Days – "Industry Days in Debrecen 2024"	26 - 27 March, 2025

National Scientific Students' Associations Conference (OTDK)	23 – 25 April, 2025
Professional Days and Exhibition in the Field of Building Services, event organized by the Department of Building Services and Building Engineering	6 - 7 March, 2025
Reporting period II (Drawing week II)	19 - 23 May, 2025 (5 working days without scheduled lessons, consultation schedule announced previously).
2nd semester examination period	26 May – 11 July, 2025 (7 weeks) In case of finalist courses: 21 April - 23 May, 2025 (5 weeks)
Thesis (BSc, MSc) submission deadline	As defined by the departments; max. 14 days of the beginning of the final examination period.
Final examination period	As defined by the departments; at least one occasion between 26 May and 26 June, 2025.

THE CIVIL ENGINEERING UNDERGRADUATE PROGRAM

INFORMATION ABOUT THE PROGRAM

Name of master's program:	Civil Engineering Undergraduate Program
Specializations available:	Structural Engineering Specialization
Field, branch:	engineering; civil engineering and mechanical earth sciences
Level:	undergraduate
Qualification:	Civil Engineer
Mode of attendance:	Full-time
Faculty:	Faculty of Engineering
Program coordinator:	Imre Kovács PhD, Head of Department, College Professor
Person in charge of the specialization:	László Radnay PhD, Associate College Professor specialized on structural engineering
Program length:	8 semesters
Credits total:	240

Objectives of the undergraduate programme, competences to be acquired:

The objective of the programme is to train civil engineers who are able to assume structural, maintenance and operation, business and magisterial tasks on buildings, to solve problems of design and simple tasks of development, complex civil engineering planning. They are up to improve their professional academic knowledge in the master programme.

Professional competences to be acquired

a) knowledge

He/She knows

- the most frequently applied structural materials, their properties and their terms of application in the field of civil engineering.
- the essential design principles and methods applied in civil engineering.
- the essential processes in building technology, the operating principles of applied equipment and machineries
- the methods and principles of groundwork, geomechanics.

- the most frequently applied procedures of measurement and survey in civil engineering and their tools, instruments, measuring machinery.
- the professional theoretical and practical building-maintenance methods of bridge art.
- information and information communication methods and procedures in association with his/her profession.
- major standards in the field of civil engineering
- the major work and fire safety requirements and environmental protection regulations in the field of civil engineering.
- the basics of logistics, management and quality assurance, law, economics forms an integral part of civil works.
- the methods of data collection, learning and their ethical limitations in the field of civil engineering.

b) skills

He/She is able to

- understand behaviour of buildings and phenomena that affect engineering work.
- apply models of civil engineering design and methods of calculation.
- apply technical specifications on building constructions and operation.
- communicate in engineering way (eg. through drawings).
- achieve as a technical leader, civil engineering inspector and constructing, accessibility, maintenance, operation, enterprise, administration tasks in every field of civil engineering.
- achieve civil engineering subtasks in the field of urban system operation and engineering
- solve simple design and development tasks individually in narrower field of civil engineering, participate in complex design and development tasks with his/her civil engineering knowledge.
- work up and apply technical literature.

c) attitude

He/She is capable to

- complete tasks at high quality to the best of his/her ability
- be open to complete his/her tasks individually but in collaboration with other participants.
- endeavour to solve tasks and make decision with learning the opinion of the directed colleagues preferably in harmony with it.
- be open to learn professional and technological development in the field of civil engineering and preferably his/her restricted specialty.
- aim at continuous self-training.
- pay attention to the principles and application of environment protection, quality politics, equal access, the principles of health and safety at work and engineering ethics. He/she takes care of facilitating and treating employees' professional improvement

d) authonomy and responsibility

He/She

- makes decisions on simple design, structural, maintenance-operation, enterprise and authority tasks in the field of civil engineering.
- manages and controls his/her staff according to his/her leader's guidance of his/her leader, checks the operation of applied equipment and machinery.
- evaluates the efficiency, security of the staff work.
- monitors the legal, technical, technological and administrative changes in the professional field.

COMPLETION OF THE ACADEMIC PROGRAM

The Credit System

Majors in the Hungarian Education System have generally been instituted and ruled by the Act of Parliament under the Higher Education Act. The higher education system meets the qualifications of the Bologna Process that defines the qualifications in terms of learning outcomes: statements of what students know and can do on completing their degrees. In describing the cycles, the framework uses the European Credit Transfer and Accumulation System (ECTS).

ECTS was developed as an instrument of improving academic recognition throughout the European Universities by means of effective and general mechanisms. ECTS serves as a model of academic recognition, as it provides greater transparency of study programmes and student achievement. ECTS in no way regulates the content, structure and/or equivalence of study programmes.

Regarding each major, the Higher Education Act prescribes which professional fields define a certain training program. It contains the proportion of the subject groups: natural sciences, economics and humanities, subject-related subjects and differentiated field-specific subjects.

For the Civil Engineering BSc program, the following professional fields define the training:

- natural sciences [mathematics (at least 12 credits), physics, mechanics, chemistry] 40-60 credits;
- economics and humanities (economics, management and business economics, state administration and law) 15-25 credits;
- civil engineering compulsory subjects (materials science, civil engineering draw, geodesy, geoinformatics, geotechnics, building constructions, civil engineering, traffic technology and water engineering, urban and environmental engineering) 80-120 credits.

Special knowledge can be acquired on the bases of the eligible specializations that are offered on demand of the civil engineering field. Within the programme 55-85 credits must be completed on the specializations offered by the higher education institution.

Minimum of credit points assigned to optional subjects: 12

Credit points assigned to thesis: 15

Credits total: 240

During the program students have to complete a total amount of 240 credit points. It means approximately 30 credits pro semester. The curriculum contains the list of subjects (with credit points) and the recommended order of completing subjects which takes into account the prerequisite(s) of each subject. You can find the recommended list of subjects/semesters in chapter “Guideline”.

Guideline (Lisf of Subjects/Semesters)

The total number of credit points (240) of the training program can be obtained by completing the subjects of the curriculum. There is a certain degree of freedom in the order students can complete the subjects. However, it is recommended that the suggested order be followed because some subjects can only be taken after the completion of the prerequisite subject(s), and/or can be the prerequisites for other subjects.

The list of subjects you have to complete in the semesters according to the model curriculum of Civil Engineering BSc programme Structural Engineering Specialization:

1st semester	2nd semester
Mathematics I	Mathematics II
Descriptive Geometry	Statics
Informatics for Civil Engineers	Economics
Civil Engineering Orientation	Introduction to Building Construction
Civil Engineering Draw	Geoinformatics I
3rd semester	4th semester
Strength of Materials	Dynamics
Civil Engineering CAD I	Hydraulics & Hydrology I
Geoinformatics II	Geotechnics I
Construction Materials	Planning & Design of Transport Facilities
Theory of Transportation & Basics in Urban Planning	Theory of Design & Approximate Calculations
5th semester	6th semester
Theory of Girders	Construction Management
Introduction to Water Engineering	Geotechnics III
Geotechnics II	Reinforced Concrete Structures
Steel Structures	Building Design
Building Construction	Steel Structures for Buildings
7th semester	8th semester

Reinforced Concrete Structures for Buildings	Management & Business Economics
Timber & Masonry Structures	State Administration, Law & Estate Registering
FEM Modelling	Structural Engineering Compulsory Exam
Structural Design Project	Diploma Project
Bridges & Civil Engineering Structures	

About the prerequisites of each subject please read the chapter “Course Descriptions”!

Work and Fire Safety Course

According to the Rules and Regulations of University of Debrecen students have to complete the online course for work and fire safety in the first semester of their studies. Registration for the course and completion are necessary for graduation.

Registration in the Neptun system by the subject: MUNKAVEDELEM

Students have to read an online material until the end to get the signature on Neptun for the completion of the course. The link of the online course is available on webpage of the Faculty.

Internship

Civil Engineering BSc students have to carry out a 6-week internship/Urban Systems Engineering MSc students have to carry out a 4-week internship. The course ’Industrial practice’ should previously be signed up for via NEPTUN in the prior spring semester right before the internship is due to be completed. Completion of internship is a prerequisite of the pre-degree certificate. The vocational practice can be completed in the semester provided for in the model curriculum after the completion of at least some of the professional subjects.

Students get acquainted with professional work in conformity with their major at the company or institution and join in the daily working process. They have to resolve tasks independently assigned by their supervisor and gain experiences may be utilized later in the labour market. During the internship common and professional competences may be acquired. Common competences: precise working on schedule either individually or in team, talk shop applying correct technical terms. Professional competences: applying the professional skill gained during the training and acquiring new knowledge.

Places suitable for internship

All the organizations, institutions and companies in Hungary or abroad, provide students with the opportunity to acquire proficiency in accordance with their specialization in the field of operation, repairing technology, installation, management and development of different machines and vehicles, may be a suitable place.

Furthermore

- This organization undertakes in writing to accept the student for internship. (Invitation letter)

- This organization undertakes in writing to certify and evaluate the student's work at the end of the internship. (Evaluation sheet)

The organization will not compulsorily make a cooperation with the University about providing the place for internship. (Internship Cooperation)

(Due to the changes in the legislation it is not compulsory to make an Internship Cooperation between a tertiary institute and an organization in case of internships shorter than 6 weeks. If a company insists on it in order that it could certify the student's presence at a control a cooperation can be made.)

An Internship Cooperation has to be transmitted in 4 copies to the Secretariat of Department of Civil Engineering (2-4, Ótemető Street, 4028 Debrecen)

All the necessary formal documents can be downloaded from the website of the Faculty of Engineering. www.eng.unideb.hu/en (Current Students/Study Programs in English /Civil Engineering BSc/Internship)

Physical Education

According to the Rules and Regulations of University of Debrecen a student has to complete Physical Education courses at least in two semesters during his/her Bachelor training. Our University offers a wide range of facilities to complete them. Further information is available from the Sport Centre of the University, its website: http://sportsci.unideb.hu.

Optional courses

According to the Rules and Regulations of University of Debrecen a student has to complete optional (elective) courses during his/her Bachelor or Master training. These optional courses are opened by the Departments at the Faculty of Engineering at the beginning of the actual semester. A student can also select optional courses from other faculties of University of

Debrecen to complete but these courses are accepted with less credits than they have originally. During your training you can complete optional subjects in any semester. There is no maximum limit of credits gained on optional courses but please note that courses completed on Erasmus scholarship often can be transferred as optional subjects into your curriculum. In the Civil Engineering BSc programme, you have to gain at least 12 credits with completing optional subjects.

Pre-degree Certification

A pre-degree certificate is issued by the Faculty after completion of the bachelor (BSc) program. The pre-degree certificate can be issued if the student has successfully completed the study and exam requirements as set out in the curriculum, the requirements relating to Physical Education as set out in Section 10 in Rules and Regulations, internship (mandatory) – with the exception of preparing thesis – and gained the necessary credit points (120). The pre-degree certificate verifies (without any mention of assessment or grades) that the student has fulfilled all the necessary study and exam requirements defined in the curriculum and the requirements for Physical Education. Students who obtained the pre-degree certificate can submit the thesis and take the final exam.

Diploma Project (Thesis)

A Thesis is a creative, professional task (in the field of science, engineering, design, implementation, research, development or research development) on the basis of a specialization made in written form too. Its solution is based on the student's professional studies, the study of domestic and international and the control of his/her supervisor and referee. Making and defending his/her thesis success a graduate on civil engineering bachelor of sciences program certifies that he/she is capable to apply his/her acquired knowledge in practice to summarize the work approved and the results in an expert way, to solve problems creatively in his/her topic, to provide independent expert work.
A graduate on bachelor program has to make a thesis as a prerequisite of taking a final exam. The requirements of the program include the requirements on the content of a thesis, the general aspects of evaluation and the number of credits attributed to a thesis. The number of credits attributed to a thesis is 15 in the civil engineering bachelor program.
Thesis topics announcement must be issued by the departments till the end of the 4th week of the final semester. A student can also offer a thesis topic of which adoption the head of the competent department decides. The requirements of adopting an essay written on Scientific Students' Associations (SSA essay) to a thesis is controlled by the Faculty that is based on the fact that an SSA essay has to meet the all the formal and content requirements of a thesis and the evaluation committee of the internal conference suggest its development into a thesis.
The formal requirements of a thesis are decided by the Department of Civil Engineering and they are delivered at the same time with the thesis topic announcement.

Thesis making is controlled by a full-time instructor as a supervisor appointed by the department and an external person as a referee appointed by an industrial partner. The circumstances and partial deadlines decided by the department must be complied.

The faculty academic calendar (issued by the Vice-Rector for Education) sets the thesis submission deadline, for want of this the deadline is 12 noon the 14th day before the first day of the final exam. A thesis is evaluated by the supervisor and the referee (internal and external). The Head of Department of Civil Engineering makes suggestion on its qualification on the bases of the reviews to the Final Examination Board. If the referee or the supervisor and the Department may evaluate the thesis congruently with a fail mark by the head of department, the student is not allowed to take the final exam and is supposed to modify his/her thesis or prepare a new one. A student must be informed about it. Conditions on resubmitting the thesis are defined by the program coordinator.

Final exam

After the subject check list is approved a student finishes his studies with taking the final exam of Civil Engineering BSc. This final exam is to check and assess knowledge he acquired during his training and he has to prove that he is able to apply it. The requirements of the final exam are determined in the requirements of Civil Engineering BSc training. A final exam is allowed to take in the exam periods. A final exam can be taken before the examination board. The Final Exam Board consists of external (industrial or performing the profession) and internal members. If a student does not complete his final exam till the termination of his student status, he can pass it any time in a final exam period after the termination according to the operative requirements and rules on the final exam.

In the major of Civil Engineering BSc, the final exam means the defence of the thesis in 15-minute presentation that is followed by a 10-minute debate.

Evaluation of the final exam

The oral exam is evaluated according to a five-scale grading system then the final grade of the final exam is decided by voting in a closed consultation. In case of vote equality, the Board Chairman's vote is decisive. The result of the final exam is announced by the Board Chairman. A report is drawn up about the final exam. The partial results and the qualification of the degree must be registered in the lecture book too.

Repeating a failed Final exam

If any part of the final exam is failed it can be repeated according to the rules and regulations. A final exam can be retaken in the forthcoming final exam period. If the Board qualified the

Thesis unsatisfactory a student cannot take the final exam and he has to make a new thesis. A repeated final exam can be take twice on each subject.

The Final Examination Board

The Chairman of the State Board is adjured from the external and internal experts in the field by the Dean with the support of the Faculty council. According to the tradition of the Faculty a vice chairman is appointed too in case he is unable to be present. A Final Exam Board is formed by at least one external (industrial or profession performing) and two internal members (with a Ph.D. degree). The charge of the Board lasts for one year. The sequence of the candidates is put out by the Registry Office at the Faculty.

COURSE DESCRIPTIONS FOR CIVIL ENGINEERING BSC

The order of subject follows the subject list in the model curriculum.

Subject group "Basic Natural Sciences"

Mathematics I

Code: MK3MAT1A08GX17_EN, MK3MAT1A08EX17_EN, MK3MAT1A08RX17_EN
ECTS Credit Points: 8
Evaluation: mid-semester grade
Year, Semester: 1st year/1st semester
Its prerequisite(s): -
Further courses are built on it: Yes/No
Number of teaching hours/week (lecture + practice): 4+4

Topics:

The basic notions of linear algebra, differentiation and integration for real functions; some applications in physics.

Part A - Linear algebra: real numbers, coordinate systems, sets, sequences of real numbers and their limit, series of real and complex numbers, series of real functions, vector geometry, vector algebra and applications, the set of the complex numbers, complex series, approximation of real functions, matrices, determinants, vector spaces, systems of linear equations, linear functions

Part B - Differential and integral calculus: real functions, elementary functions, limit and continuity of real functions, differentiation, L'Hospital's rule, Taylor polynomial, analysis of differentiable functions, primitive function (antiderivative), indefinite integral, the Riemann integral, the Newton-Leibniz theorem, numerical integration, improper integral, applications of the integral

Literature:

Required:

- Adrienn Varga, Mathematical Analysis for Engineers, Debrecen, Hungary: Dupress (2019), 118 p. ISBN: 9789633188156
- Lajos, Hajdu; Adrienn, Varga, Engineering Mathematics: part I. Debrecen, Hungary: Dupress (2021), 154 p. ISBN: 9789633189030

Recommended:

- Thomas' Calculus, Addison Wesley (11th edition, 2005), ISBN: 0-321-24335-8
- S. Minton, Calculus Concept and Connections, McGraw Hill (2006), ISBN 0-07111200-6

Recommended textbook:

- Síki Gusztáv Áron, Nagy Kondor Rita, Kézi Csaba, Differential and integral calculus for Engineering and Economists Debrecen, Magyarország: Dupress (2019), 225 p. ISBN: 9789633187418

Schedule

1st week Registration week	
2nd week: **Lecture:** Part A1: Sets, Real numbers Part A2: The set of the complex numbers **Practice:** Part A1: Sets, Real numbers Part A2: The set of the complex numbers	**3rd week:** **Lecture:** Part A1: Vectorgeometry, vectoralgebra Part A2: Vectorgeometry, vectoralgebra **Practice:** Part A1: Vectorgeometry, vectoralgebra Part A2: Vectorgeometry, vectoralgebra
4th week: **Lecture:** Part A1: Matrices Part A2: Vector spaces **Practice:** Part A1: Matrices Part A2: Vector spaces	**5th week:** **Lecture:** Part A1: Systems of linear equations Part A2: Linear functions **Practice:** Part A1: Systems of linear equations Part A2: Linear functions
6th week: **Lecture:** Part A1: Determinations of eigenvalues, eigenvectors. Part A2: Calculations with mathematical softwares. **Practice:** Part A1: Determinations of eigenvalues, eigenvectors. Part A2: Calculations with mathematical softwares	**7th week:** **Lecture:** Part A1: Real functions, elementary functions and their inverses Part A2: Polynomials and interpolations **Practice:** Part B1: Real functions, elementary functions and their inverses Part B2: Polynomials and interpolations
8th week: 1st drawing week	

9th week:

Lecture:

Part B1: Sequences

Part B2 : Series

Practice:

Part B1: Sequences

Part B2 : Series

10th week:

Lecture:

Part B1: Limits of real functions, continuity of real functions

Part B2: Differentiation of real functions, linear approximation

Practice:

Part B1: Limits of real functions, continuity of real functions

Part B2: Differentiation of real functions, linear approximation

11th week:

Lecture:

Part B1: Mean value theorems, investigation of differentiable functions

Part B2: L'Hospital's rule, Taylor polynomials.

Practice:

Part B1: Mean value theorems, investigation of differentiable functions

Part B2: L'Hospital's rule, Taylor polynomials.

12th week:

Lecture:

Part B1: Primitive functions, indefinite integral, integration by parts, integral with substitutions

Part B2: Definite integral (Riemann integral), Newton-Leibniz theorem

Practice:

Part B1: Primitive functions, indefinite integral, integration by parts, integral with substitutions

Part B2: Definite integral (Riemann integral), Newton-Leibniz theorem

13th week:

Lecture:

Part B1: Improper integrals. Applications of the integration in geometry and physics

Part B2: Numerical integration

Practice:

Part B1: Improper integrals. Applications of the integration in geometry and physics

Part B2: Numerical integration

14th week:

Lecture:

Part B1: Regression

Part B2: Mathematical softwares

Practice:

Part B1: Regression

Part B2: Mathematical softwares

15th week: 2nd drawing week

Requirements

A, for a signature and mid-semester grade:

Participation at practice classes is Requirements

A, for a signature and mid-semester grade:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three practice classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. The final grade can be obtained in the following way:

- students write two tests (Test I part A, Test II part A) from the linear algebra part of the material; maximum 50+50=100 points can be achieved
- students write a two tests (Test I part B, Test II part B) from the differential and integral calculus part of the material; maximum 50+50=100 points can be achieved

Mark ranges after the four tests:

- 175-200 points: excellent (5)
- 150-174 points: good (4)
- 125-149 points: satisfactory (3)
- 100-124 points: sufficient (2)
- 0-99 points: insufficient (1)

Those who fail, or do not accept their marks, can write a Test in any of the first three weeks of the exam period. This Test is a combination of the previous four tests, maximum 50 points can be achieved, and the mark ranges are proportional to the above table. For exam dates see Neptun. If someone does not accept her/his mark, it is possible to get any mark (better, the same, or worse) than the original mark by writing this Test.

Mathematics II

Code: MK3MAT2A06GX17_EN, MK3MAT2A06EX17_EN, MK3MAT2A06RX17_EN
ECTS Credit Points: 6
Evaluation: mid-semester grade
Year, Semester: 1st year/2nd semester
Its prerequisite(s): Mathematics I
Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+4

Topics:

Differentiation and integration of multivariable and vector-valued functions, differential equations.

Part A: Differentiation and integration of multivariable vector-valued functions (2 hours lecture+2 hours practise/week): Metric, topology, sequences in the space. Linear functions. Parametric curves. Notions of differentiation, linear approximation, curvature, torsion. Parametric surfaces, tangent plane, linear approximation. Surfaces of revolution, ruled surfaces. Scalar field, gradient. Young's theorem. Directional derivative. Local and global extrema. Vector fields. Derivatives. Divergence and curl. Potential function. The notion of double and triple integrals on 2 and 3 dimensional intervals. The extensions of the integrals. Integrals over general regions. The arc length of curves, surface area. Line and surface integrals. The theorems of Gauss and Stokes, Green's formulae. Applications in physics.

Part B: Differential equations (2-hour practise/week): Notions of differential equations, classification of differential equations, initial value problem. Problems leading to differential equations. First order linear differential equations (homogeneous and inhomogeneous, method of variation). Determination of solutions of inhomogeneous first order linear differential equations. Higher order linear differential equations. Solution of linear homogeneous differential equations of order two having constant coefficients. Method of undetermined coefficients. Special second order differential equations. The Laplace transform and its applications. Slope fields, numerical methods. (Euler, Runge-Kutta).

Literature:

Required:

Recommended:

- Thomas' Calculus, Addison Wesley (11th edition, 2005), ISBN: 0-321-24335-8
- S. Minton, Calculus Concept and Connections, McGraw Hill (2006), ISBN 0-07111200-6
- M. D. Greenberg, Fundamentals of engineering analysis, Cambridge University Press, ISBN 978-0-521-80526-1

Recommended textbook:

Schedule

1st week Registration week	
2nd week:	3rd week:
Lecture:	Lecture:

Part A: Metric, topology, sequences in $\mathbb{R}^n$. **Practice:** Part A: Limits of vector sequences Part B: Notions of differential equations	Part A: Parametric curves I. **Practice:** Part A: Differentiation. Part B: Problems leading to differential equations.
4th week: **Lecture:** Part A: Parametric curves II. **Practice:** Part A: Curvature, torsion Part B: First order linear differential equations	**5th week:** **Lecture:** Part A: Differentiable functions of type $\mathbb{R}^n \to \mathbb{R}^m$. **Practice:** Part A: Derivatives of functions of type $\mathbb{R}^n \to \mathbb{R}^m$. Part B: Higher order linear differential equations.
6th week: **Lecture:** Part A: Parametric surfaces **Practice:** Part A: Surfaces of revolution Part B: Solution of linear homogeneous differential equations of order two having constant coefficients	**7th week:** **Lecture:** Part A: Scalar field, gradient. Young's theorem. Directional derivative. **Practice:** Part A: The domains of functions of type $\mathbb{R}^2 \to \mathbb{R}$. Directional derivative and gradient. Part B: Summary, sample test
8th week: 1st drawing week	
9th week: **Lecture:** Part A: Local and global extrema **Practice:** Part A: Local extremas of functions of type $\mathbb{R}^2 \to \mathbb{R}$, $\mathbb{R}^3 \to \mathbb{R}$. Part B: Method of undetermined coefficients	**10th week:** **Lecture:** Part A: Vector fields **Practice:** Part A: Vector fields Part B: Special second order differential equations.

11th week: **Lecture:** Part A: Double and triple integrals **Practice:** Part A: Integrals on 2 and 3 dimensional intervals Part B: Laplace transform	**12th week:** **Lecture:** Part A: Integrals over general regions **Practice:** Part A: Applications Part B: Slope fields, numerical methods.
13th week: **Lecture:** Part A: Line and surface integrals. **Practice:** Part A: arc length of curves, surface area. Line and surface integrals Part B: Potential functions	**14th week:** **Lecture:** Part A: Mathematical software **Practice:** Part A : Summary, sample test Part B : Summary, sample test
15th week: 2nd drawing week	

Requirements

A, for a signature and mid-semester grade:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three practice classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented.

The final grade can be obtained in the following way:

- students write a mid-term test (Test I, B) from differential equation part of the material in the first drawing week; maximum 30 points can be achieved
- students write a mid-term test (Test I, A) from the differential and integral calculus part of the material in the first drawing week; maximum 50 points can be achieved
- students write an end-term test (Test II, B) from the differential equation part of the material in the second drawing week; maximum 30 points can be achieved

- students write an end-term test (Test II, A) from the differential and integral calculus part of the material in the second drawing week; maximum 50 points can be achieved

Mark ranges after the four tests:

144-160 points: excellent (5)

128-143 points: good (4)

104-127 points: satisfactory (3)

80-103 points: sufficient (2)

0-79 points: insufficient (1)

Those who fail, or do not accept their marks, can write a Test in any of the first three weeks of the exam period. This Test is a combination of the previous four tests, maximum 80 points can be achieved, and the mark ranges are proportional to the above table.

For exam dates see Neptun. If someone does not accept her/his mark, it is possible to get any mark (better, the same, or worse) than the original mark by writing this Test.

Descriptive Geometry

Code: MK3MAT3A4SX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Monge's method of projecting. Intersections. Determining distances and angles of the objects. Methods of replacing image-planes.

Literature:

Compulsory:

- Church, A. E.: Elements of Descriptive Geometry, American Book Company, University of Michigan
- Ledneczky, P.: Descriptive Geometry I., BUTE
- Pare, E. G.,- Loving, R. O. - Hill, I. L. - Pare, R. C.: Descriptive Geometry, Amazon

Schedule

1st week Registration week	
2nd week: **Practice:** Axonometry, perspective; Introduction to multiview projection	3rd week: **Practice: Introduction to the Monge's method of projecting** Projection of the space-elements (points, lines, segments, planes), Relative position of two straight lines, Special positions of a straight line to image planes, Special positions of the planes to the image planes
4th week: **Practice: Points and lines in the plane** Line in a plane, point in a plane, First mainline and second mainline in a plane, Point in a first/second projecting plane	5th week: **Practice: Intersection of a line with the plane** Intersection of a line with the projecting plane, Intersection of a line with the plane (in general position). Visibility
6th week: **Practice: Intersection of two planes** The intersection line of projecting planes, The intersection line of planes, if one of them is in projecting position, Intersection line of two planes	7th week: **Practice: Method of replacing image-planes** (transformation of views) Introduction of new image planes, the method of the replacing of an image plane with a new plane. Rotation of the plane
8th week: 1st drawing week	
9th week: **Practice: Metric tasks I. Determining distances and angles of the objects** Distance between two points. Lenght of the line-segment. Distance from a point to a plane. Distance from a point to a line. Angle of inclination of a line to the image-planes. Angle formed by two planes. Perpendicularity	10th week: **Practice: Metric tasks II. Determining distances and angles of the objects** Distance between two parallel lines. Distance between two skew lines. Distance between two parallel planes. Angle formed by two lines.
11th week: **Practice:** Representation of circle	12th week: **Practice: Intersection of the polyhedrons with lines and planes** Prisms and pyramids
13th week: **Practice: Intersection of two polyhedrons** Intersection of prisms and pyramids	14th week: **Practice: Curved surfaces** (Cylinders, Cones, Spheres)

	Intersection of curved surfaces with planes. Development of a curved surfaces and intersections, Kochanski's Approximation.

15th week: 2nd drawing week

Requirements

A, for a signature:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three of them during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at practice classes will be recorded by the instructor. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented.

B, for a grade:

Active participation is evaluated by the teacher in every class. If student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as absence because of the lack of active participation in class. Students must write tests during the semester.

Informatics for Civil Engineers

Code: MK3INF1A4SX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

The subject consists of 4 parts: spreadsheet, database management, design and programming. This informatics knowledge is useful for students during the practice of their profession.
Excel and Access are two applications to deal with tabular data efficiently and conveniently. Excel has the basic features to organize data manipulation allowing the user to employ a wide variety of numerical methods. Access is used in storing information that can be accessed by a lot of people.
AutoCAD is a computer-aided design (CAD) and drafting software application.
LabVIEW is an interactive, graphical programming language that is ideal for engineers. It is widely used for data acquisition, instrument control and industrial automation.

Literature:

- Microsoft OFFICE 2010 HOME & STUDENT V2010
- Elliot Gindis, AutoCAD, 2017, Academics Press, 2017
- Robert H Bishop, Learning with LabVIEW, Pearson, 2015

Schedule

1st modul (week 1-8): EXCEL and ACCESS

2nd modul (week 9-15): AUTOCAD and LABVIEW

1st week Registration week	
2nd week: Practice: Introducing Excel. User interface of the software. Entering and editing Data. Types of Data. Fill a Range with Series. Formatting and editing Worksheet. Font type and size. Align Text. Number Format. Column Width, Row Height. Borders. Wrap Text. Build an AutoSum Formula. Basic Functions	3rd week: Practice: Creating Charts. Chart types. Chart Elements. Format and customize Excel Charts. Building Formulas. Type of Functions. Move or copy a Formula. Reference another Range in a Formula. Naming groups of data
4th week: Practice: Analysing data. Reordering and summarizing data: Sort a Range. Filter a Range. Summarize Data with Subtotals. Practice of spreadsheet learning.	5th week: Practice: Database basic. Elements of relational databases: tables, records, fields, keys, primary keys, indexes. Relationship between tables, relationship types. User interface of the software. Create a new database. Create and import tables. Data types. Create relation between tables. Referential Integrity. Insert, delete, update records, fields.
6th week: Practice: Format. Input masks. Fast Finding, Filtering, and Sorting Data. Queries (Select, Crosstab). Calculated fields. Summarizing Data. Queries (Make table Queries, Append Queries, Update Queries, Delete Queries)	7th week: Practice: Create forms using the Form wizard. Create Reports using the Report wizard. Formatting a Report. Create Switchboard. Model and create a new database. Practice the learned material.
8th week: 1st drawing week, Mid-term exam	
9th week: Practice: Introducing AutoCAD. Classic workspace. Menu Bar. Toolbars. Command Windows. Setting Up a Drawing. Drawing Units, Drawing Size. Status bar. Grid and Snap. Drawing Commands. (Line, Polyline, Polygon, Rectangle, Arc, Circle, etc.) Object Snap.	10th week: Practice: Cartesian Coordinates. Polar Coordinate System. Absolut and Relative Coordinates. Dimensioning a Drawing. Change View. Hatch. Text in a Drawing.

11th week: **Practice:** Editing objects. (Move, copy, mirror, offset, array, rotate, scale, break, extend, chamfer, fillet, etc.) Using Layers. Blocks. Practice the learned material.	12th week: **Practice:** Introducing LabView. Graphical programming. Virtual instruments. User interface of the software. Main components: Front Panel, Block Diagram, Icon and Connector pane. Data types. Elements of Block Diagram: Nodes, Functions, subVÍs.
13th week: **Practice:** Data Flows model. Troubleshooting and debugging. Decision making: Using Select. Using Case Structure. Loops: While loop. For Loop. Iterative data transfer: Use Shift register. Timing.	14th week: **Practice:** Modularity. Functions and SubVIs. Three types of Functions: ExpressVIs, Standard VIs, Functions. Creating SubVIs. File I/O. Graph Indicators. Create codes. Practice the learned material.
15th week: 2nd drawing week, mid-term exam	

Requirements

A, for signature:

Participation at practice is compulsory. Students have to attend the practices and have not to miss more than three practices during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. The attendance on practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented.

B, for grade:

Everybody has to take two mid-term exams during the semester at the end of the modules.

The minimum requirement for the mid-term exams is 50%. Based on the score of the mid-term exams, the grade for each exam is given according to the following table:

Score	Grade
0-49 %	fail (1)
50-62 %	pass (2)
63-75 % s	satisfactory (3)
76-88 %	good (4)
89-100 %	excellent (5)

Both modules must be obtained at least pass (2 grade). Students can make up or improve their grades at the last week of the semester. At the end of the semester everybody will get a final grade on the basis of the average of his/her all grades: If the average is for example (3.5) then the lecturer decides if it is (3) or (4).

Civil Engineering Orientation

Code: MK3MEC1S8SX17-EN

ECTS Credit Points: 8

Evaluation: mid-semester grade

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+2

Topics:

The lectures are focused on the basic of statics and fluid mechanics, hydraulics. Basic mechanical concepts: Vectors, Force, moment of force, Varignon's theorem, Equilibrium equations. Balancing the plane system with 2 or 3 forces. Balancing supports. Basic concepts and properties of fluids: fluids at rest and in motion; Dimension and Unit; Fluid as Continuum; Pressure; Density; Viscosity; Thermal Conductivity; Coefficient of compressibility/Bulk modulus; Surface Tension; State Relations for Gases and Liquids; Classifications of Fluid Flows; Fluid statics- Pressure distribution in atmospheres and oceans; Design of manometer pressure instruments; Forces on submerged flat and curved surfaces; Buoyancy on a submerged body; Behaviour of floating bodies. Fluids in the environment. Scope of environmental fluid mechanics. Exchange between fluid parcels of different densities and at different heights. Turbulence. Environmental fluid mechanics problems for the 21st Century. Some connections between fluid mechanics and the solving of industrial and environmental fluid-flow problems.

Literature:

Compulsory:

- EN 1990:2002/A1:2005 Eurocode - Basis of structural design.
- Munson, Bruce R., Young, Donald F., Okiishi, Theodore H., Huebsch, Wade W. Fundamentals of Fluid Mechanics, Sixth Edition. John Wiley & Sons, Inc. (2009). ISBN 978-0470-26284-9
- Marriott, M.: Nalluri & Featherstone's Civil Engineering Hydraulics: Essential Theory with Worked Examples, 6th Edition, Wiley Blackwell (2016), ISBN: 978-1-118-91563-9

Recommended:

- fib Bulletin 51 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 1., Federation International du Béton – International Federation for Structural
- Jack B. Evett Cheng Liu: 2500 Solved problems in Fluid Mechanics & Hydraulics, First Edition, McGraw Hill (1989), ISBN 0-07-0199783-0

Schedule

1st week Registration week

2nd week:	**3rd week:**
Lecture and Practice: Some Characteristics of Fluids. Dimensions, Dimensional Homogeneity, and Units. Fluid as Continuum; Pressure; Density; Viscosity; Thermal Conductivity; Coefficient of compressibility/Bulk modulus; Surface Tension. Calculation of Specific Weight, Specific Gravity, Density problems.	**Lecture and Practice**: State Relations for Gases and Liquids; Classifications of Fluid Flows; Fluid statics- Pressure distribution in atmospheres and oceans; Design of manometer pressure instruments. Fluid statics problems, U-Tube manometer problems.
4th week:	**5th week:**
Lecture and Practice: Forces on submerged flat and curved surfaces; Hydrostatic force on a plane surface; Pressure distribution and resultant force in an open tank: (a) bottom portion of the tank; (b) side of the tank. Area and moment of inertia of few common shapes. *Hydrostatic Force on a submerged surface*. Hydrostatic force on the side of a dam. Lateral force of water on the walls of a tank.	**Lecture and Practice:** Buoyancy on a submerged body; Behaviour of floating bodies. *Archimedes' principle.* Calculation different buoyancy problems.
6th week:	**7th week:**
Lecture and Practice: Fluids in the environment. Scope of environmental fluid mechanics. Exchange between fluid parcels of different densities and at different heights. Turbulence. Environmental fluid mechanics problems for the 21st Century. Some connections between fluid mechanics and the solving of industrial and environmental fluid-flow problems. Calculation of industrial and environmental fluid-flow problems.	Study trip
8th week: 1st drawing week / 1st test	
9th week:	**10th week:**
Lecture and Practice: Newton's Laws, Scalars, and Vectors. Vector Language, Intro to Vector Addition. The Triangle Rule and Adding Vectors to find a Resultant.	**Lecture and Practice:** Using Scalar Equations to Solve for 2 Unknowns, Equations and Unknowns, 3D Vectors. Instruction to moments.
11th week:	**12th week:**
Lecture and Practice: Moment about a pint and Specified Axis. Equivalent Systems, System Simplification.	**Lecture and Practice:** Equilibrium of Rigid Bodies, 2D Support. Simple 2D Reaction Forces on a Truss Problem

13th week:	14th week:
Lecture and Practice: Grouping of construction materials. Rheology of materials. Idealisation diagrams.	Study trip
15th week: 2nd drawing week / 2nd test	

Requirements

Participation at **lectures** is **compulsory**. Students must attend on lectures and may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring the calculator and the printed materials of the lectures with them to each lecture and practice class. Active participation is evaluated by the teacher in every class. Active student's participation should be required.

Students have to **submit all the two tests** as scheduled minimum at a sufficient level. During the semester there are two tests: the 1st test in the 8th week and the 2nd test in the 15th week. In order to take a **mid-semester grade** – minimum (2) pass grade, – minimum point of test has to be taken (Summa minimum 61 points from 100 points). The minimum and the maximum points related to the tests can be obtained are the follows:

Tests:				
1. Test:	Maximum:	**50 points**	Minimum:	**30 points**
2. Test:	Maximum:	**50 points**	Minimum:	**30 points**
Summa points:	Maximum:	**100 points**		**61 points**

The course ends with a **mid-semester grade**. Based on the summa points of the tests, the mid-semester grade is defined according to the following calculation:

Score		Grade
0 – 60 points:	fail	(no sign)
61 – 70 points:	pass	(2)
71 – 80 points:	satisfactory	(3)
81 – 90 points:	good	(4)
91 – 100 points:	excellent	(5)

Statics

Code: MK3MEC2S8SX17-EN

ECTS Credit Points: 8

Evaluation: Exam

Year, Semester: 1th year, 2nd semester

Its prerequisite: Civil Engineering Orientation

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 0+6

Topics:

Definitions, concurrent forces in a plane, Forces and rigid bodies in plane and in space. Simple structures, Compound structures, Trusses, Distributed forces, Internal forces, Diagrams of internal forces. Force systems in three dimensional space. Structures in three dimensional space. Force influence lines of statically determinate structures.

Literature:

Compulsory:

- Vector Mechanics for Engineers by Ferdinand P. Beer, E. Russell Johnston and Phillip J. Cornwell (2012, Hardcover) ISBN-10: 0077402324 | ISBN-13: 9780077402327

Schedule

1st week Registration week	
2nd week Practice: : Introduction, definitions, concurrent forces in a plane	3rd week: Practice: Forces in a plane
4th week: Practice: Simple structures, statically determinacy	5th week: Practice: Compound structures
6th week: Practice: Truss analysis I.	7th week: Practice: Truss analysis II.
8th week: 1st drawing week	
9th week: Practice: Trip	10th week: Practice: Distributed forces in a plane Mid-term test
11th week: Practice: Internal forces	12th week: Practice: Internal force diagrams
13th week: Practice: Simple structures in three dimensional space	14th week: Practice: Force influence lines of statically determinate structures End-term test

15th week: 2nd drawing week

Requirements

A, for a signature:

Participation at **practice** is compulsory. Students must attend practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator to each practice. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test in the 10th week and the end-term test in the 14th week. A student once can retake test in both topics, if it is necessary.

Tests:

Test 1:	Maximum:	25 points		
Test 2:	Maximum:	25 points		
	Summa: 50 points		Minimum	33 points
		50×1.5=75 points		50 points

B, for a grade:

The course ends in an **examination grade**. Based on the points of the tests and the exam. The sum of points which are given for the two tests is multiplied with 1.5 and added to the points of the exam.

Exam	Maximum:	25 points	Minimum:	10 points
Summa points	Maximum:	100 points	Minimum:	60 points

The grade is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

Strength of Materials

Code: MK3MEC3S8SX17-EN

ECTS Credit Points: 8

Evaluation: Exam

Year, Semester: 2nd year, 3rd semester

Its prerequisite: MK3MEC2S8SX17EN

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 0+6

Topics:

Definitions, attributes of the cross-sectional polygons. Characterization of the state of stress, Characterization of the state of strain. Material laws. Elastic beam model. State variables of a beam element, Equations of the beam element. Simple loading. Combined loading. State of stress, principal stresses. Displacements of the beams. Work theorems. Buckling of solid columns.

Literature:

Compulsory:

- Beer, Johnston: Mechanics of materials (7th edition, 2015), ISBN-13: 978-0073398235

Recommended:

- Budynas: Advanced Strength and Applied Stress Analysis (2nd edition, 1998), ISBN-13: 978-0070089853

Schedule

1st week Registration week	
2nd week **Practice: :** Introduction, Attributes of the cross-sectional polygon	**3rd week:** **Practice:** Stresses, strains and material laws
4th week: **Practice:** State variables of a beam element, , Equations of the beam element, Simple loading I. Centric tension or compression	**5th week:** **Practice:** Simple loading II Simple shear, Twisting
6th week: **Practice:** Simple loading III Bending, **mid-term test**	**7th week:** **Practice:** Trip.
8th week: 1st drawing week	

9th week:	10th week:
Practice: Combined loading I Beam shear (with bending)	**Practice:** Combined loading II Eccentric tension or compression
11th week:	12th week:
Practice: State of stress, principal stresses	**Practice:** Calculation of displacement I Elastic curve Small displacement theory
13th week:	14th week:
Practice: Work theorems Theorem of virtual forces, Calculation of displacement II	**Practice:** Buckling of solid columns **End-term test**
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice** is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator to each practice class. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test in the 6th week and the end-term test in the 14th week. A student once can retake test in both topics, if it is necessary.

Tests:

1. Test:		Maximum:	**25 points**
2. Test:		Maximum:	**25 points**
	Summa: **50 points**	Minimum:	**33 points**
	50×1.5=75 points		**50 points**

B, for a grade:

The course ends in an **examination grade** based on the points of the tests and the exam. The sum points which are given for the two tests is multiplied with 1.5 and added to the points of the exam.

Exam	Maximum:	**25 points**	Minimum:	**10 points**
Summa points	Maximum:	**100 points**	Minimum:	**60 points**

A grade is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

Dynamics

Code: MK3MEC4S4SX17-EN

ECTS Credit Points: 4

Evaluation: Exam

Year, Semester: 2nd year, 4th semester

Its prerequisite: Civil Engineering Orientation

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Introduction. Kinematics of particles. Kinematics of rigid bodies. Kinetics of particles. 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 bodies. Problems of impacts. Impact of falling mass and elastic structure (solid body). Free, and forced vibration problems with one degree of freedom. Free and forced vibration problems with more degrees of freedom. Vibration forced by support motion. Vibration from earthquake. Dynamic effects of wind.

Literature:

Compulsory:

- BEER F.P., JOHNSTON E.R.: Dynamics. ISBN 0-07-079926-1, McGraw-Hill cop 1988.

Recommended:

- TIMOSHENKO S.: Vibration problems in engineering. ISBN 0-471-87315-2, Wiley 1974.
- PESTEL E. C., THOMSON W. T.: Dynamics. McGraw-Hill cop 1968.
- HARRIS C. M., CREDE C. E.: Shock and vibration handbook. ISBN: 0-07-026801-0 McGraw-Hill cop 1988.

Schedule

1st week Registration week	
2nd week	3rd week:

Practice: : Introduction, Kinematics of particles, Moving in 3D	**Practice:** Kinematics of rigid bodies Translation, Rotation around fix axis, planar moving
4th week:	**5th week:**
Practice: Kinetics of particles I Newton's second law Theorem of D' Alambert	**Practice:** Kinetics of particles II Theorem of change of linear momentum Theorem of change of angular momentum
6th week:	**7th week:**
Practice: Kinetics of particles III Work of a force Theorem of change of kinetic energy Force field, Potential energy, Law of conservation of mechanical energy **Mid-term test**	**Practice:** Trip.
8th week: 1st drawing week	
9th week:	**10th week:**
Practice: Kinematics of rigid bodies I Second order moment of mass Principles of rigid bodies kinetics	**Practice:** Kinematics of rigid bodies II Linear momentum of a rigid body Angular momentum of a rigid body
11th week:	**12th week:**
Practice: Impacts	**Practice:** Vibration I Free vibration of S-DOF systems
13th week:	**14th week:**
Practice: Vibration II Forced vibration of S-DOF systems	**Practice:** Vibration III Vibration of M-DOF systems **End-term test**
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice** is compulsory. Students must attend practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator to each practice class. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test in the 6th week and the end-term test in the 14th week. A student once can retake the test in both topics, if it is necessary.

Tests:

Test 1: Maximum: **25 points**

Test 2: Maximum: **25 points**

Summa: **50 points** Minimum: **33 points**

50×1.5=75 points **50 points**

B, for a grade:

The course ends in an **examination grade** based on the points of the tests and the exam. The sum points which are given for the two tests is multiplied with 1.5 and added to the points of the exam.

Exam Maximum: **25 points** Minimum: **10 points**

Summa points Maximum: **100 points** Minimum: **60 points**

A grade is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

Theory of Girders

Code: MK3MEC5S4SS17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 3th year, 5th semester

Its prerequisite: Strength of Material

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Introduction. Force and displacement influence lines of statically determinate structures. Maximal internal forces and the diagrams of maximal internal forces. Solution of statically indeterminate plane structures by the force method. Force influence lines of statically indeterminate structures with the force method. Solution of statically indeterminate plane structures by the displacement method. The Cross method. The mechanical displacement method. The General matrix equation of planar rod structures.

Literature:

Compulsory:

- Aslan Kassimali: Structural Analysis (ISBN- 13: 978-1133943891)

Recommended:

- Budynas: Advanced Strength and Applied Stress Analysis (ISBN-13: 978-0070089853)
- Popov: Mechanics of materials (ISBN-13: 978-0135713563)

Schedule

1st week Registration week	
2nd week **Practice:** Force influence lines of statically determinate structures with the Theorem of virtual displacements	3rd week: **Practice:** Displacement influence lines of statically determinate structures with the Theorem of virtual forces
4th week: **Practice:** Maximal internal forces and the diagrams of maximal internal forces	5th week: **Practice:** Solution of statically indeterminate plane structures by the force method
6th week: **Practice:** Force influence lines of statically indeterminate structures with the force method Mid-term test	7th week: **Practice:** Trip.
8th week: 1st drawing week	
9th week: **Practice:** Solution of statically indeterminate plane structures by the displacement method	10th week: **Practice:** The Cross method
11th week: **Practice:** The mechanical displacement method	12th week: **Practice:** The General matrix equation of planar rod structures
13th week: **Practice:** Practicing the displacement method and revision	14th week: **Practice:** End-term test
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice** is compulsory. Students must attend the practices and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. Attendance on practice will be recorded by the practice leader. Being late is

counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator to each practice class. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test in the 6th week and the end-term test in the 14th week. If the score of any test is below 30 from 50 points, a student once can retake the test in both topics.

Tests:

Test 1:		Maximum: 50 points
Test 2:		Maximum: 50 points
	Summa: 100 points	Minimum: 60 points

B, for a grade:

The mid-semester grade is based on the points of the tests.

A grade is given according to the following (score/grade): 0-59 = fail; 60-69 = pass (2); 70-79 = satisfactory (3); 80-89 = good (4); 90-100 = excellent (5).

Economics

Code: MK3GAZ1M4SX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 1+3

Topics:

This course aims to make students familiar with the basic concepts of microeconomic and macroeconomic analysis. In particular, the course will be focused on the analysis of how economic actors, consumers and firms choose between different alternatives. By the end of the course, the student should be able to use the basic tools and models of microeconomics and macroeconomics, and apply them in solving problems. The course focuses on the theory and application of the following: Microeconomic processes, The basics of supply and demand. Market equilibrium. Elasticity of demand (supply). Consumer behaviour - Households’ choices (Marginal utility theory). Firm’s production (factors), costs of production, profit-maximizing behaviour. Market structures (perfect competition, imperfect competition: monopoly). Profit maximizing under perfect competition, and monopoly. Cost-benefit and Break-even analysis. Measuring macroeconomic output (real vs. nominal Gross Domestic Product, Gross output). Consumption and Investment. Household and firm sector. Investment multiplier. Economic role of government (externalities). Fiscal policy and output determination. The role of money in the economy, the evolution of money, central bank, commercial banking, the supply and the demand for money. Monetary policy. Aggregate demand and supply. Labour market. Unemployment and inflation.

Literature:

Required literature:

- Mankiw, Gregory (2009): Principles of Economics. Fifth Edition. South-Western, Mason, USA, 2009. ISBN:9780324589979.
- Mankiw, Gregory (2015): Principles of Economics. Study Guide. Seventh Edition. Cengage Learning, ISBN-13:978-1-285-86421-1.
- Judit T. Kiss (2014): Introduction to Macroeconomics for Engineers and Technical Managers. Debrecen University Press. ISBN: 978-963-318-416-5.
- Judit T. Kiss (2015): Introduction to Microeconomics for Engineers and Technical Managers. Debrecen University Press. ISBN: 978-963-318-469-1.

Recommended literature:

- K. E. Case – R. C. Fair – S. M. Oster (2012): Principles of Macroeconomics, Tenth Edition. Prentice Hall, ISBN 13: 978-0-13-139140-6.
- Samuelson P.A., Nordhaus W.D. (2006): Economics, 18th edition, Academic Internet Publishers Inc., 2006. ISBN: 0072872055
- Parkin, M., Powell, M. & Matthews, K. (2008) Economics. 7th ed. Harlow: Addison Wesley. ISBN-13: 9780132041225
- Besanko, David – Breautigam, Ronald R. (2014): Microeconomics. Fifth Edition (International Student version). John Wiley and Sons, Inc., New York. ISBN: 978-1-118-71638-0
- Besanko, David – Breautigam, Ronald R. (2008): Microeconomics. Study Guide. Third Edition. John Wiley and Sons, Inc., New York, 2008.

Schedule

1st week Registration week	
2nd week: Lecture: *Basic concepts of Economics and Microeconomics* Introduction to Microeconomics and Macroeconomics, models in Economics. Key analytical tools (Comparative statics, Equilibrium analysis, Constrained optimization). Efficiency and use of resources. Practice: Calculation/team problems: Main economic problems. Case study examination.	3rd week: Lecture: The components of the Macroeconomics. The circular flow Diagram. Market sectors – commodity, money and labour market. Practice: Calculation/team problems: Circular flow of income. Case study examination.
4th week: Lecture: *Measuring Macroeconomic Output* Circular flow – market sectors. Output and Income. Price level, Consumer price index. Measuring macroeconomic output (Gross Output, Gross Domestic Product, calculating GDP, real versus nominal GDP, the components of the GDP, GDP deflator and Produce price index). Practice: Calculation/team problems: measuring macroeconomic income and output. The difference between nominal and real GDP. GDP deflator and Produce price index.	5th week: Lecture: *The Keynesian Theory – Aggregate demand* Consumption function, marginal propensity to consume. Saving function, marginal propensity to saving. Economic role of investment, Mathematical and geometrical derivation of the equilibrium output. Investment multiplier, main influencing factors of investment. Derivation of investment – saving curve. Practice: Calculation/team problems: consumption and saving function, Investment multiplier. Investment-saving function.

6th week:

Lecture: *Government in the economy*

Government expenditures and revenues. Types of taxes, disposable income, government budget, determination of equilibrium output, fiscal policy, the government spending multiplier, the tax multiplier. Average tax rate, tax wedge, and marginal tax rate.

Practice: Calculation/team problems: The role of the government in the economy. Tax burden and tax multiplier. Market equilibrium analysis.

7th week:

Lecture: *Demand and supply*

Demand curves, Supply curves; Market equilibrium. Calculation problems: equilibrium price and quantity; market demand and individual demand; shifts versus movements along the demand curve (supply curve); shifts versus movements along the supply curve. *Types of elasticity of demand*

Price elasticity of demand, cross price elasticity of demand, income elasticity of demand. The elasticity of supply. Total revenue and the price elasticity of demand. Increase in total revenue. Taxes and elasticity.

Practice: Midterm Test I.

8th week: 1st drawing week

9th week:

Lecture: *Production*

Factors of production. Inputs, outputs and production function. Marginal product of labour and average product of labour. Law of diminishing marginal returns to labour (capital).

Costs of production

Total, fixed and variable costs, marginal and variable cost. The relationship between marginal and average cost. Total revenue, total profit curves. Calculating problems (types of cost, relationship between cost and profit. opportunity cost).

Practice: Calculation/team problems; (average product of labour (capital), marginal product of labour (capital), relationship between marginal product and average product. Marginal cost, total, variable and fixed cost, average costs.

10th week:

Lecture: *Condition of profit maximization*

Main condition of profit maximization under competitive market. Main characteristics of the competitive market. Marginal cost, average costs of production, profit-maximizing output, shut down and breakeven point, profit and loss. The competitive firm's supply curve.

Practice: Calculation/team problems: marginal average revenue, total revenue, average and marginal profit, profit-maximizing output, marginal cost curve and supply curve. Determination of the shut down and breakeven point.

11th week:

Lecture: *Perfect and Imperfect competition*

Monopoly (the profit-maximization condition); *Money market*

12th week:

Lecture: *Money market*

The demand for money. Supply and demand in the money market. The

The meaning of money, the functions of money, measuring the supply of money. The creation of money, required reserve ratio. The money multiplier. Fisher effect (nominal and real interest rate).

Practice: Profit maximization condition (Monopoly), consumer and producer surplus. Equilibrium analysis.

13th week:

Lecture: *The labour market*

The demand for labour, the supply of labour. The labour force, working-age population, active and inactive population, labour participation rate. Supply curve and demand curve, equilibrium. Employed population.

Practice: Calculation/team problems: Supply of labour function, and demand for labour function, equilibrium analysis.

equilibrium interest rate. Mathematical and geometrical derivation of the LM curve.

Practice: Calculation/team problems: The equilibrium output and price-level. Case study analysis.

14th week:

Lecture: *Main macroeconomic problems – Unemployment and inflation*

Measurement of Unemployment, the unemployment rate, the employment and activity rate. Types of unemployment (voluntarily and involuntarily unemployment; structural, frictional and cyclical unemployment), Okun law. Inflation; (Price level, inflation rate, definition and measuring of inflation, types and causes of inflation, moderate, galloping and hyperinflation, demand side and supply side inflation, The relationship between unemployment rate and inflation rate – Philips curve).

Practice: Case study examination and team problems: Measurement of unemployment. Reasons for inflation, Philips curve.

15th week: 2nd drawing week

Requirements

A, for a signature:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three occasions during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor.

During the semester there are two tests: the mid-term test on the 7th week and the end-term test on the 15th week. Students must sit for the tests.

B, for a grade (ESE):

The course ends in an **examination.**

The minimum requirement of the mid-term, the end-term test and the teamwork is 50% separately. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

The grade is given according to the following (score/grade): 0-49 % = fail (1); 50-62 % = pass (2); 63-75 % = satisfactory (3); 76-89 % = good (4); 90-100 % = excellent (5).

If the score of any test is below 50%, the student once can take a retake test of the whole semester material.

An offered grade: It may be offered for the students if the average of the mid-term test, end-term tests and the teamwork is at least good (4). The offered grade is the average of them.

Construction Management

Code: MK3MUM1M4SX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 3rd year, 1st 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Students learn about the participants of investments in construction, they are bound to their duties. Parts of a construction contract, together with the documents and the role of historical documents. Budget in construction, location, a role, and a part of the methods of calculation. The concept of overhead hourly wage, the price of construction materials and the method of calculation of the cost. After making a plan of complete budget should be sized calculations and shaped plans. Standard time allowance for labelling and defining technological order. Create a budget based on the total of the previous semester band prepared schedule, making machine schedule, preparation of staff schedules. Creating organizational layout in three phases. Substructure work types, structural work and during the final phase of work. Learning about temporary structures, temporary utilities, roads and means of disposal solutions and marking of installed equipment. Efforts should be made for both the installation and closed freely available land to be planned!

Schedule

1st week Registration week	
2nd week:	3rd week:
Practice: Technology, building materials and technology, the foundation, walls and	Practice: Technology, building systems, partitions, doors, windows, flooring,

columns / pillars, floors, roofs and map overlays, traffic building	engineering, electrical, mechanical lifts, heating and cooling, finishing work.
4th week:	5th week:
Practice: ISO Utility Structures: scaffolding, supports. An auxiliary structure: pattern sheets, formwork, trench supports. Size and quantity statement in a tabular form.	**Practice:** Construction: demolition, excavation design, provide support, drainage, foundation, masonry, plastering, concreting, wood structures, steel structures, transportation, lifting
6th week:	7th week:
Practice: The budget includes: item systems, overhead hourly rate, job costs, calculating the cost of materials. Preparation of budget, computerized by TERC Common laboratory work and building visit, concepts, models.	**Practice:** Spatial organization: Site Buildings, structures, roads. Energy and utilities board. Calculation of Working Time Standards Collecting and spending time laboratory work using the TERC
8th week: 1st drawing week	
9th week:	10th week:
Practice: Spatial organization: storage of building materials and products. Internal mass transport. Preparation of construction and substructure work. Spatial organization: the auxiliary. Creating spatial organizational plans	**Practice:** Time management: Concepts. Types of rate plans. Portrayal of the Schedule. Time scheduled basic elements: training processes. Analyses of processes: process of time and labor expenses. The combination of processes (determine relative time positions. Facades and outdoor finishing work +building visit
11th week:	12th week:
Practice: The time scheduled basic elements: The mesh design- critical path. A continuous band-like construction management, construction management. Technology-based construction management (business management). The recommended process of planning time. The time scheduled update. Standard data.	**Practice:** A project as a process. The task of setting Project participants (Facility Director, preparation, foremen, technicians etc. ..) tasks and roles through practical examples, in addition to types of constructional work, participants, tasks and roles.
13th week:	14th week:
Practice: Workspace delivery and the receipt of a report in the way of finishing	**Practice:** Implementation - organizing implementation. Building log and diary survey. Requirements of a building plant room (social spaces, warehouses ...)
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory. Participation at practice classes is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice class with another group. Attendance at practice will be recorded by the practice leader. Students have to submit all the drawings (band prepared schedule, making machine schedule, preparation of staff schedules + organizational layout in three phases) tasks as scheduled minimum at a sufficient level. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week.

B, for a grade:

The course ends in a mid-semester grade (AW5). Based on the average of the marks of the drawings and the average of the test results, the mid-semester grade is calculated as an average of them: - the average grade of the drawing tasks - the average grade of the two tests Special conditions for signing and examination: Mid-semester (continuous) accountability Creating the task: 1 80 80 points 80 points 50.0% Performance of the task and the conditional-release test must be more than 50% for a mid-year signing. You need to reach 41 points.

Management and Business Economics

Code: MK3MEN1M4SX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 4th year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+0

Topics:

The aim of the course is to provide students with a comprehensive knowledge of organization's operation and the role of leadership and organization. Understand the different forms of business, the stakeholders of a company, the concept of investments and economic analysis. Students should be able to analyse corporate costs and expenses, and make calculations. Acquire basic knowledge of human and wage management. The acquisition of basic relationships of corporate strategy and marketing.

Literature:

Compulsory:

- A. Griffiths, S. Wall: Economics for Business and Management, Pearson, 2011

- James C. Collins: Good to Great: Why Some Companies Make the Leap...and Others Don't, Harper Business, 2001
- P. Hawken: Growing a Business, Simon and Shuster, 1988

Schedule

1st week Registration week	
2nd week: Lecture: The company's core resources and processes	3rd week: Lecture: The company as an organization
4th week: Lecture: Management functions, manager roles, tasks	5th week: Lecture: Organization theory
6th week: Lecture: Theoretical basics of management methodology	7th week: Lecture: Flow of information in the organisation
8th week: 1st drawing week	
9th week: Lecture: Entrepreneur concept, stakeholders. Forms of companies	10th week: Lecture: Corporate strategy, Business Plan
11th week: Lecture: Concept of investments, economical analysis	12th week: Lecture: Definition of costs, coverage calculation
13th week: Lecture: Human resource management, waging and motivation	14th week: Lecture: Corporate marketing
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at lectures is compulsory. Students must attend lectures and may not miss more than three of them during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the lecturer. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed lectures must be made up for at a later date, being discussed with the tutor.

Students have to write two mid-term tests during the semester. The first (40 points max) in the 8th, the second (40 points max) in the 14th week. At the end of the semester everybody will get a seminar grade on the basis of the following: (score/grade): 0-39 = fail; 40-50 = pass (2); 51-60 = satisfactory (3); 61-70 = good (4); 71-80 = excellent (5).

If somebody fails, then he/she has to write both tests in the 1st week of the exam period again. If the result is 40 points (50%) or better, then he/she can take an exam. If somebody has to repeat his/her mid-term tests, then his/her seminar grade can't be better than (2).

There will be homework week by week. Only students who have handed in all their homework at the time of the mid-term test will be allowed to write it. The problems have to be solved in the mid-term tests will be selected from the homework assignments.

B, for a grade:

Everybody will get an exam grade for their exam. The final grade will be the average of the seminar and the exam grade. If it is for example (3.5) then the lecturer decides if it is (3) or (4).

State Administration, Low & Estate Registering

Code: MK3GAZ2M4SX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 4th year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+0

Topics:

This subject helps the students to understand the basics of a legal relationships. The subject also covers the organization of the, powers, duties, and functions of public authorities of all kinds engaged in administration; their relations with one another and with citizens and nongovernmental bodies; legal methods of controlling public administration; and the rights and liabilities of officials. The subject also helps the students understand the organization of a national legislature, the structure of the courts, the characteristics of a cabinet, and the role of the head of state, and the government. It introduces sources of law and legal method, business organizations and legal relationships, contracts including the supply of goods and services. Since Hungary is a part of the European Union the subjects also covers the basic knowledge of European Union Law.

Literature:

Compulsory:

- The basic Law of Hungary, Lóránt Schink, Balázs Schanda, András Zs. Varga, Clarus Press, 978-1-905536-45-0

Schedule

1st week Registration week	
2nd week **Lecture:** The introduction of Hungarian legal system, the basics, the Constitution, and the sources of law in Hungary and in the European Union.	3rd week: **Lecture:** The basics of state administration, the legislative, executive bodies, the Parliament, the Government, the Head of state. The court system in general.
4th week: **Lecture:** The role of the local goverments in Hungary, and the institutes of the local administration.	5th week: **Lecture:** Hungary and The European Union, the history, the legal and institutional changes since Hungary joined the EU. The sources of Law in the European Union.
6th week: **Lecture:** The basic legal phrases of the civil law in Hungary and in the law of the European Union, the sources of law, the legal relationships, the law system.	7th week: **Lecture:** The most important features and legal rules of the legal person. The founding documents, the common rules of legal persons (entrepreneurships), the organization of legal persons.
8th week: 1st drawing week	
9th week: **Lecture:** The most important features and rules of contracts in Hungarian and EU Law. The rules of the freedom of the contracts.	10th week: **Lecture:** Most important individual contracts in Hungarian and EU Law, especially sales contract, entrepreneurship contract, employment contract.
11th week: **Lecture:** The working and development Estate Registry in Hungary, and the common rules in the European Union.	12th week: **Lecture:** The practical introduction of the individual contracts, explaining the common rules and the differences.
13th week: **Lecture:** The Hungarian legal system compared with other legal systems in the European Union, examining the continental legal system, and the common law.	14th week: **Lecture:** Questions and answers, comparison of Hungarian legal system with the students' home countries'.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at lectures is compulsory. Students must attend lectures and may not miss more than three occasions during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any lectures with

another group. Attendance at lectures will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed lectures must be made up for at a later date, being discussed with the tutor.

B, for a grade:

For their exam everybody will get an exam grade.

Subject group "Compulsory Subjects"

Civil Engineering Draw

Code: MK3MAG1S6SX17-EN

ECTS Credit Points: 4 credits

Evaluation: mid-semester grade

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 2+2

Topics:

The series of lectures are based on the relevant standards.

It reviews the fundamental rules and formal requirements of technical drawing, drawing of projections, views and sections, auxiliary and sectional views. Representations of threaded parts, and threaded fasteners, gears, splines and keys. Drawing standardized machine elements and the concept of manufacturing tolerance and fitting, dimensional specification, geometrical and positioning tolerance, surface roughness and the rules of elaboration of the workshop drawing and detailed drawings of simple machine elements.

In seminar there are six tasks to elaborate: workshop drawing of different machine elements and components.

Literature:

Compulsory:

- TIBA ZS.: Machine Drawing, ISBN 978-963-318-066-2, Debrecen University Press 2010.

Schedule

1st week Registration week

2nd week: **Lecture:** Drawing standards, formal requirements of machine drawings. Drawing sheet dimensions, title block, defining the line types and thickness groups. Standardized letter and figure shape and sizes, scales, full size, reduction scales, enlarged scales. **Practice:** issuing task 1: Lettering	**3rd week:** **Lecture:** Defining the surfaces of a part. Presentation method in machine drawing, views, auxiliary view, local view, breaking, sectional views and sections. **Practice:** issuing task 2: Drawing Machine Parts. Practicing the presentation methods.
4th week: **Lecture:** Complex sectional views, removed element, removed sections, specific sectional views and sections, conventional practice in machine drawing. **Practice:** submitting the task 1: Lettering, elaborating the task 2. Practicing the presentation methods.	**5th week:** **Lecture:** General prescriptions for dimensioning, choosing basis surfaces. Conventional dimensioning methods. **Practice:** submitting the task 2, issuing the task 3: Shaft drawing. Practicing the presentation methods.
6th week: **Lecture:** Specific dimensioning, defining and giving conical taper and flat taper **Practice:** Applying the dimensioning methods to dimensioning parts.	**7th week:** **Lecture:** ISO Tolerance system. Basic size, actual size, limits, deviations, fundamental deviation. Defining the tolerance IT grades, hole-base system, shaft base system. Free dimensional tolerance. **Practice:** submitting the task 3, issuing the task 4: Designing Fitting Pieces. Applying the cutting plane and the cutting sphere method to construct the intersection lines of interpenetrating surfaces. Applying the triangulation and parallel line methods to Develop fitting pieces. Representing tolerances and calculating its dimensions.
8th week: 1st drawing week	
9th week: **Mid-term test** **Lecture:** ISO Tolerance system. Defining fits: clearance, transition and interference fit. Form and position tolerances. **Practice:** Designing Fitting Pieces. Applying the triangulation and parallel line methods to	**10th week:** **Lecture:** Defining the surface roughness. Feasible roughness with different processing methods. Correlation between the surface roughness and the IT grade of dimension. **Practice**: issuing the task 5: Screw Fastening and Joints. Presentation of tolerances and fits in drawing. Presentation of surface roughness in drawing.

Develop fitting pieces. Representing fits and calculating its dimensions. Elaborating the shop drawing of pattern development of fitting pieces.	
11th week:	12th week:
Lecture: Standardized Thread forms and its main features. Threads and thread symbols in drawing. Threaded joints: bolted joint, studded joint, screw fastening. Practice: elaborating the task 5, Drawing threaded joints in section and on view.	Lecture: springs: standardized representation of helical spring, Belleville spring, buffer spring, annular spring, multi-leaf spring. Keyed joints with saddle keys, sunk keys, parallel keys and woodruff keys. Splined shaft joint. Practice: submitting the task 5, issuing the task 6: Gearing. Drawing keyed joints and splined shaft joint in section and on view.
13th week:	14th week:
Lecture: Gears and toothed parts. Spur and helical gears, bevel gears, worms, rack and pinion gears, sprockets. Practice: elaborating the gear task 5. Drawing meshing gears in section and on view.	End-term test Lecture: rolling bearings: ball and roller bearings. Riveted joints. Welding symbols and welded joints: butt joint, lap joint, tee joint, corner joint. Practice: submitting the task 6. Drawing bearings, riveted and welded joints in section and on view.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory.

Participation at practice is compulsory. Students must attend the practical classes and may not miss more than three practical classes during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. The attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

Students have to submit all the six drawing tasks as scheduled minimum at a sufficient level.

During the semester there are two tests: the mid-term test is in the 9th week and the end-term test in the 14th week. Students have to sit for the tests.

B, for a grade:

The course ends in a mid-semester grade. Based on the average of the marks of the drawings and the average of the test results, the mid-semester grade is calculated as an average of them:

average grade of the six drawing tasks

average grade of the two tests

The minimum requirement for the mid-term and end-term tests is 60%.

Based on the score of the tests separately, the grade for the tests is given according to the following (score/grade): 0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5).If the score of any test is below 60, the student once can take a retake test covering the whole semester material.

Introduction to Building Construction

Code: MK3MAG2S6SX17-EN

ECTS Credit Points: 6 credits

Evaluation: exam grade

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Descriptive Geometry, Civil Engineering Draw

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Subjects of building construction science. Primary and inferior structures of buildings. Effects on buildings, requirements. Horizontal load-bearing structures. Arches. Solid floors. Monolithic and prefabricated RC floor structures. Frame-type buildings, architectural features. Structure of monolithic RC frame buildings, space limiting structures. Foundation and under grade insulation. Pitched roof: roof truss and roofing. Flat roof. Door (external and internal), window. Floor, stairs. Chimneys and ventilation shafts. Floor finish, façade finish (envelope).

In seminar there are six tasks to elaborate: 3 homework drawings and 3 workshop drawings.

Literature:

Compulsory:

- AMBROSE, James E.: Building structures, ISBN 0471540609 Wiley, New York 1993.
- BÖHÖNYEY, J.: Building construction encyclopaedia. Iparterv, Budapest 1986.

Schedule

1st week Registration week

2nd week: **Lecture:** Subjects of building construction science. Primary and inferior structures of buildings. Effects on buildings, requirements. **Practice:** issuing task 1 (homework drawing). Elaborating the workshop drawing 1.	**3rd week:** **Lecture:** Horizontal load-bearing structures. Arches. Solid floors. Monolithic and prefabricated RC floor structures. Frame-type buildings, architectural features. Structure of monolithic RC frame buildings, space limiting structures. **Practice:** consultation of task 1 (homework drawing)
4th week: **Lecture:** Foundation. **Practice:** consultation of task 1 (homework drawing)	**5th week:** **Lecture:** Under grade insulation. **Practice:** submitting task 1 (homework drawing). Elaborating the workshop drawing 2.
6th week: **Lecture:** Pitched roof: roof truss and roofing 1. **Practice:** Issuing task 2 (homework drawing). Elaborating the workshop drawing 3.	**7th week:** **Lecture: Mid-term test** **Practice**: consultation of task 2 (homework drawing)
8th week: 1st drawing week	
9th week: **Lecture:** Pitched roof: roof truss and roofing 1. Flat roof. **Practice:** consultation of task 2 (homework drawing)	**10th week:** **Lecture:** Door (external and internal), window. **Practice**: submitting task 2 (homework drawing). Issuing task 3 (homework drawing).
11th week: **Lecture:** Floor, stairs. Chimneys and ventilation shafts. **Practice:** consultation of task 3 (homework drawing)	**12th week:** **Lecture:** Floor finish. **Practice:** consultation of task 3 (homework drawing)
13th week: **Lecture:** Façade finish (envelope). **Practice:** submitting task 3 (homework drawing).	**14th week:** **End-term test**
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory.

Participation at practice is compulsory. Students must attend the practice classes and may not miss more than three practice classes during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

Students have to submit all the six drawing tasks as scheduled minimum at a sufficient level.

During the semester there are two tests: the mid-term test is in the 7th week and the end-term test in the 15th week. Students have to sit for the tests.

Homework drawings:	3 x 25 points = 75 points
Tests:	2 x 25 points = 50 points
Workshop drawings:	bonus points (max. 5, for all)
Mid-semester points Σ	125 points

For signature students must achieve more than 50% of points (63 points).

B, for a grade:

The course ends in an exam.

Mid-semester points:	125 points
Colloquium:	50 points
Σ	175 points

Score	Grade
0-87	fail (1)
88-109	pass (2)
110-131	satisfactory (3)
132-153	good (4)
154-175	excellent (5)

Civil Engineering CAD I

Code: MK3CAD1S4SX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 3rd semester

Its prerequisite: Descriptive Geometry, Civil Engineering Draw

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Making construction plans in ArchiCAD software. Settings of the program, applying styles for construction plans. Making foundation, reinforced concrete, steel and wooden construction plans.

Presentation of the history of CAD. Presentation of the screen. Giving the coordinates and drawing with coordinates. Introduction of draw (line, polygon, circle, arch, line chain, etc.) and draw modifying commands (erase, copy, mirror, array, move, rotate, etc.). Managing the layer and introduction of features, settings. Settings of the line type, context and dimension style. Usage of palettes and tools. Creating and using blocks and references. Introduction of inquiries. Presentation of draw settings, customizing and settings. Detailed presentation of drop-down boxes and toolbars. Usage of model space and paper space. Settings of printing and printing.

Making construction plans in AutoCAD software. Settings of the program, applying styles for construction plans. Making foundation, reinforced concrete, steel and wooden construction plans.

Presentation of the history of CAD. Presentation of the screen. Giving the coordinates and drawing with coordinates. Introduction of draw (line, polygon, circle, arch, line chain, etc.) and draw modifying commands (erase, copy, mirror, array, move, rotate, etc.). Managing the layer and introduction of features, settings. Settings of the line type, context and dimension style. Usage of palettes and tools. Creating and using blocks and references. Introduction of inquiries. Presentation of draw settings, customizing and settings. Detailed presentation of drop-down boxes and toolbars. Usage of model space and paper space. Settings of printing and printing.

Literature:

Compulsory:

- ArchiCAD 17 help

www.autodesk.com, AutoCAD help

Schedule

1st week Registration week	
2nd week: **Practice:** Presentation of the history of CAD. Presentation of the screen. Usage of palettes and tools.	3rd week: **Practice:** Presentation of draw settings, customizing and settings. Detailed presentation of drop-down boxes and toolbars.

	Giving the coordinates and drawing with coordinates.
4th week: **Practice:** Introduction of draw (line, polygon, circle, arch, line chain, etc.) and draw modifying commands (erase, copy, mirror, array, move, rotate, etc.).	5th week: **Practice:** Drawing practice.
6th week: **Practice:** 1st test	7th week: **Practice:** Presentation of draw settings, customizing and settings, drawing slab plan.
8th week: 1st drawing week	
9th week: **Practice:** 2nd test	10th week: **Practice:** Presentation of draw settings, customizing and settings, drawing ground plan.
11th week: **Practice:** Settings of printing. Semester summary.	12th week: **Practice:** Drawing practice.
13th week: **Practice:** 3rd test	14th week: **Practice:** Repeat test.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at practice is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice class with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

Students have to submit all the six drawing tasks as scheduled minimum at a sufficient level.

B, for a grade:

The course ends in mid-semester grade.

The minimum requirement for the mid-term and end-term tests is 60%. Based on the score of the tests separately, the grade for the tests is given according to the following (score/grade): 0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5).

If the score of any test is below 60, the student can't take any repeat test.

Geoinformatics I

Code: MK3GEO1S6SX17-EN

ECTS Credit Points: 6 credits

Evaluation: mid-semester grade

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Civil Engineering Orientation

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+2

Topics:

The history of surveying and mapping. The principle of place definition. Reference systems (horizontal, vertical). Projection systems. Important domestic projections (geodesic, geographic). International and domestic basic point networks (horizontal, vertical, 3D). Methods of defining basic points and connecting points. Creating polylines, assessing equipment, Analogous, analytical and numeric assessing procedures. Orthophoto. Inner, relative and absolute transformations. Applying photogrammetry. Basic geodesic instruments and measuring methods. Getting acquainted with and practicing with the tools. Location definition with satellites.

Literature:

Compulsory:

- W. Schofield and M. Breach (2007): Engineering Surveying 6th edition ISBN–13: 978-0-7506-6949-8, ISBN–10: 0-7506-6949-7
- Wolfgang Torge, Jürgen Müller (2012): Geodesy ISBN: 978-3-11-025000-8.
- James A. Elithorp, Jr. and Dennis D. Findorff: Geodesy for Geomatcs and GIS Professionals, 2nd edition.

Recommended:

- A. Bannister, S. Raymond, R Baker (1992): Surveying ISBN: 0-470-21845-2

Schedule

1st week Registration week

2nd week: **Lecture:** Historical surveying, surveying and geodesy, control networks **Practice:** Adding angles, geodetic coordinate systems, transferring whole circle bearings.	**3rd week:** **Lecture:** History of mapping, types of maps **Practice:** Levelling the instrument, setting up a theodolite.
4th week: **Lecture:** The Earth's coordinate system (longitude, latitude), datum **Practice:** Practicing of the horizontal- and vertical-circle readings.	**5th week:** **Lecture:** Surveying for mapping, surveying methods, triangulation, total stations **Practice:** Compute the orientation angle. Computing the WCB, 1st and 2nd fundamental task of geodesy.
6th week: **Lecture:** Trilateration, measuring distances, electronic distance measurement instruments. **Practice:** Computing the mean orientation angle.	**7th week:** **Lecture:** Surveying using GPS and conclusion **Practice:** Intersect with interior angles, intersect with bearings
8th week: 1st drawing week / Short test	
9th week: **Lecture:** Fundamentals of photogrammetry. Analog and digital photogrammetry. Orthophotography. Fundamentals of topography. **Practice:** Topographic practice, drawing contour lines, creating contour map	**10th week:** **Lecture:** Resection, arc-section **Practice:** Determine a free station, calculating a resection.
11th week: **Lecture:** Setting out straight lines, angles, points in given horizontal and vertical positions. **Practice:** Setting out points with geometric criteria with theodolite and total station. Setting out of a building.	**12th week:** **Lecture:** Traversing: Methods and solutions. **Practice:** Measuring and computation of a free traverse line.
13th week: **Lecture:** Traversing: Types of traverse lines **Practice:** Measuring and computation of an inserted traverse line.	**14th week:** **Lecture:** Area calculations. Coordinate trans-formations **Practice:** Transformation of local (measured-) coordinates to a national countrywide coordinate system.
15th week: 2nd drawing week / End-term theoretical test/ qualifier practice	

Requirements

Attendance at lectures is recommended, but not compulsory.

Participation at practice is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring the calculator with them to each practice. Active participation is evaluated by the teacher in every class. Active student's participation should be required.

During the semester, there are two tests: the first one is in the 8th week, and the end-term test in the 15th week. Only the end-term-test is compulsory.

On the 8th week the student may write a short test about the subjects of the first 6 lectures and practices. The maximum reachable point is 10. There is no minimum limit, thus it is not repeatable and the students can't rectify the result of this test.

On the 15th week the students have to write the theoretical test for maximum 90 points. The minimum requirement for the end-term tests is 45 points. If the score of the theoretical test is below 45, the student once can take a retake test on the next week.

During the semester, there is one qualifier practice in the 15th week.

Students have to complete the qualifier practice as scheduled at a minimum sufficient level.

In order to take a mid-semester grade – minimum (2) pass grade – minimum point of tests has to be taken. The minimum and the maximum points related to the tests can be obtained are the follows:

Tests:				
1st Test:	Maximum:	**10 points**	Minimum:	-
2nd Test:	Maximum:	**90 points**	Minimum:	**45 points**

Summa points:	Maximum:	**100 points**	**45 points**

The course ends with **mid-semester grade**. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score	**Grade**
0 – 50 points:	fail (no sign.)
51 – 61 points:	pass (2)
62 – 74 points:	satisfactory (3)
75 – 87 points:	good (4)
88 – 100 points:	excellent (5)

Geoinformatics II

Code: MK3GEO2S6SX17-EN

ECTS Credit Points: 6 credits

Evaluation: exam

Year, Semester: 2nd year, 3rd semester

Its prerequisite(s): Geoinformatics I

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 4+2

Topics:

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. Database structures of geoinformatical 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. Requirements against geoinformatical analysing systems. Graph-based analyses. Mathematical logic and fuzzy logic in analyses. Experts systems. Overlay and buffer operations.

Methods of height determinations, trigonometrical height determinations, levelling. Errors, types of errors, error propagation. Location definition with satellites. Using manual navigation GPS equipment. Basic concepts of space information technology. Space information systems (construction, characterization, models, applications). Construction surveys.

Literature:

Compulsory:

- Christopher B. Jones (1997): Geographical information systems and computer cartography, ISBN: 0 582 04439 1
- Paul A. Longley (2005): Geographical information systems and science, ISBN: 047087001X (pbk)

Recommended:

- A. Bannister, S. Raymond, R Baker (1992): Surveying ISBN: 0-470-21845-2

Schedule

1st week Registration week	
2nd week:	3rd week: **Lecture:** How GIS works **Practice:** Basic functions of OPENJump

Lecture: Basic definitions of the Geographical Information Systems. History of the GIS. **Practice:** GIS software, free solutions, and system environment of OPENJump.	
4th week: **Lecture:** Building geodatabase / Geodatabase design principles. **Practice:** Raster and vector data in OPENJump	**5th week:** **Lecture:** Vector and raster spatial data models. **Practice:** Basic queries and analyses in OPENJump. Cartographic output in OPENJump, visualizing of the results
6th week: **Lecture:** Database planning. Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) **Practice:** Case study: Green Infrastructure in OPENJump. Case study: "Logging" Project	**7th week:** **Lecture:** Using GIS in the daily engineering practice, case studies **Practice:** Student's presentations about their own project
8th week: 1st drawing week / Short test	
9th week: **Lecture:** Methods off height determination **Practice:** Trigonometric heightening	**10th week:** **Lecture:** Levelling **Practice:** Measuring the front of a building
11th week: **Lecture:** Errors, types of errors **Practice:** Differential levelling with optical level	**12th week:** **Lecture:** Angles errors. **Practice:** Levelling with surveyor's digital level
13th week: **Lecture:** LIDAR. Laser scan. **Practice:** Processing levelling data - cross sections	**14th week:** **Lecture:** Construction surveys **Practice:** GNSS measuring - real time kinematic observations
15th week: 2nd drawing week / End-term theoretical test/ qualifier practice	

Requirements

Attendance at lectures is recommended, but not compulsory.

Participation at practice is compulsory. Students must attend the practices and may not miss more than three practice classes during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to

bring a calculator to each practice. Active participation is evaluated by the teacher in every class. Active student's participation should be required.

During the semester, there are two tests: the first one in the 8th week, and the end-term test in the 15th week. Only the end-term-test is compulsory.

On the 8th week the student may write a short (self-control) test about the subjects of the first 6 lectures and practices. The maximum reachable point is 10. There is no minimum limit, thus it is not repeatable and the students can't rectify the result of this test.

On the 15th week the students have to write the theoretical test for maximum 90 points. The minimum requirement for the end-term tests is 45 points. If the score of the theoretical test is below 45, the student once can take a retake test on the next week.

During the semester, there is one qualifier practice in the 15th week.

Students have to complete the qualifier practice as scheduled at a minimum sufficient level.

The course ends in an **exam grade**. Based on the results of the 2 tests, students are offered an exam grade if the grade of the tests is at least satisfactory (3).The students can either accept or refuse the offered grades. If a student does not accept the grade offered by the lecturer, they should sit for a written exam during the examination period. Evaluation of the written exam is according to the following (score/grade): 0-50 % = fail (1); 51-61 % = pass (2); 62-74 % = satisfactory (3); 75-87 % = good (4); 88-100 % = excellent (5).

Hydraulics & Hydrology I

Code: MK3VIZ1S6SX17-EN

ECTS Credit Points: 6

Evaluation: exam

Year, Semester: 2nd year, 4th semester

Its prerequisite(s): Civil Engineering Orientation

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Hydraulics: Elementary fluid mechanics. Understanding of the fundamental principles of hydrostatics and hydrodynamics; the basic ideas of dimensioning of hydraulic structures and hydraulic machinery. Hydrostatics (absolute and relative equilibrium, pressure head diagrams and buoyancy). Application of the Bernoulli equation (laminar and turbulent flow in pipes, losses and pipe systems). The impulse momentum equation, open channel flow (Chezy). Specific energy, supercritical and subcritical flow, hydraulic jump, stilling basins. Gradually varying channel flow. Hydraulic control structures, bridges, culverts. Wave theory. Shock waves in open channels and in pipes. Laminar and turbulent flow, analysis of laminar flow through pipes and porous media, turbulent flow velocity and shear stress distribution, energy loss equation, hydraulically smooth and rough pipes. Hydraulic machinery.

Hydrology: Processes and components of precipitation, evapotranspiration, infiltration and runoff. Quantity and quality of surface and subsurface waters. Anthropogenic impacts on the elements of the water cycle. Overall understanding of physical hydrologic principals, processes and related observation/measurement techniques, calculation methods: including the ability to critically analyse and apply that understanding to new problems. The aspects of hydrology in water management and civil engineering practice. The content provides a good basic background for further studies or work.

Literature:

Compulsory:

- Bruce R. Munson, Donald F. Young, Theodore H. Okiishi: Fundamentals of Fluid Mechanics, John Wiley and Sons (2009), ISBN: 978-0470262849
- Marriott, M.: Nalluri & Featherstone's Civil Engineering Hydraulics: Essential Theory with Worked Examples, 6th Edition, Wiley Blackwell (2016), ISBN: 978-1-118-91563-9
- Andrew Chadwick, John Morfett, Martin Borthwick: Hydraulics in Civil and Environmental Engineering, Fifth Edition, (2013), CRC Press Taylor & Francis Group, ISBN-10: 0415672457
- L. Hamill: Understanding Hydraulics, 3rd edition, (2011), Palgrave Macmillan, ISBN-10: 0230242758
- Wilfried Brutsaert: Hydrology, An Introduction, Cambridge University Press (2005), ISBN: 978-0-521-82479-8
- Martin R. Hendriks: Introduction to Physical Hydrology, Oxford University Press Inc., NY (2010), ISBN: 978-0-19-929684-2
- C.S.P. Ojha, R. Berndtsson, P. Bhunya: Engineering Hydrology, Oxford University Press (2008), ISBN-13: 978-0-19-569461-1

Recommended:

- Cheng Liu, Ranald V. Giles, Jack B. Evett: Schaum's Outline of Fluid Mechanics and Hydraulics (2014), ISBN10 0071831452
- Merle C. Potter, David C. Wiggert: Schaum's Outline of Fluid Mechanics (2008), ISBN10 0071487816
- Jack B. Evett Cheng Liu: 2500 Solved problems in Fluid Mechanics & Hydraulics, First Edition, McGraw Hill (1989), ISBN 0-07-0199783-0
- Kenneth N. Brooks, Peter F. Ffolliott, Joseph A. Magner, Hydrology and the management of watersheds, Fourth Edition, A John Wiley and Sons, Inc. (2013), ISBN-13: 978-0-4709-6305-0/2013
- Tamim Younos, Tammy E. Parece (Ed.): Sustainable Water Management in Urban Environments, The Handbook of Environmental Chemistry Vol47, Springer International Publishing Switzerland (2016), ISBN: 978-3-319-29335-6

Schedule

1st week Registration week	

2nd week:	3rd week:
Lecture: Elementary fluid mechanics. Practice: Selected Problems in Fluid Mechanics	Lecture: Understanding of the fundamental principles of hydrostatics and hydrodynamics; the basic ideas of dimensioning of hydraulic structures and hydraulic machinery. Hydrostatics (absolute and relative equilibrium, pressure head diagrams and buoyancy). Practice: Calculus - practice problems (Hydrostatic Pressure and Force; Center of Mass; Hydrostatic Equation; Pressure and fluid statics, Buoyant force example problems.
4th week:	5th week:
Lecture: Application of the Bernoulli equation (laminar and turbulent flow in pipes, losses and pipe systems). The impulse momentum equation, open channel flow (Chezy). Practice: Fluid Mechanics Problem Solving on Bernoulli Equation; Chezy and Manning equations	Lecture: Specific energy, supercritical and subcritical flow, hydraulic jump, stilling basins. Gradually varying channel flow. Hydraulic control structures, bridges, culverts. Wave theory. Shock waves in open channels and in pipes. Practice: Analytical solution to problems of hydraulic jump in horizontal triangular channels; Hydraulic jumps in rectangular channels; Classic energy problem in open-channel flow
6th week:	7th week:
Lecture: Laminar and turbulent flow, analysis of laminar flow through pipes and porous media, turbulent flow velocity and shear stress distribution, energy loss equation, hydraulically smooth and rough pipes. Hydraulic machinery. Practice: Pipe Flow Calculations; Reynold's Number Calculation	Study trip: Tisza Dam (Kisköre Dam); *Fish Ladder*
8th week: 1st drawing week / 1st test	
9th week:	10th week:
Lecture: Introduction to hydrology and hydrogeology: the focus of hydrology. The role of hydrology in the society and economy. Physical forms of water. The hydrologic cycle and the water budget. Water balance equation. The effect of the climate change on the elements of the hydrological cycle.	Lecture: Precipitation: forms and types of precipitation. Theories of precipitation formation. Quantity variables – in time and space. Rain characteristics. Evaporation: the physics of evaporation. Evaporation of open water surface, soil and vegetation – evaporation, transpiration and evapotranspiration

Practice: Solving examples for water balance equation	Practice: Calculation of average areal precipitation with different methods and calculation of precipitation extrema. (Montanari method). (Homework No 1.)
11th week:	12th week:
Lecture: Infiltration: process and characteristics. The infiltration curve. Water forms in the soil. Characterization of ground-water regimes. Physical, chemical and bacteriological properties of ground water. Potential pollution sources impacting sub-surface waters. Practice: Calculation of infiltration through porous medium – Darcy's law	Lecture: The runoff process. The importance of the watershed. Watershed characteristics. The time of concentration, runoff ratio. Type of surface waters. Hydrology of streams (potamology). Cross- and longitudinal sections of streams and their valleys. Stream characterization. Type and characteristics of lakes. Practice: Watershed delineation. (Homework No 2.) Performing the double transformations for rainfall-runoff calculations.
13th week:	14th week:
Hydrology in the water management and civil engineering practice. Study trip	Lecture: Streamflow regimes. Frequency and duration. Relation between water level and discharge – QH curve. Permanent and non-permanent rating curves. Flash floods. Practice: Calculation of frequency and duration curves (Homework No 3.).
15th week: 2nd drawing week / 2nd test	

Requirements

Participation at **lectures and practice classes** are **compulsory**. Students must attend lectures and may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator and the printed materials of the lectures to each lecture and practice. Active participation is evaluated by the teacher in every class. Active student's participation should be required.

Students have to **submit all the two tests and the five homework tasks** as scheduled minimum at a sufficient level. During the semester there are two tests – the 1st test is in the 8th week and the 2nd test in the 15th week – and there are five homework tasks. In order to get the signature minimum point of tests and home works has to be taken (Summa minimum 61 points from 100 points). The minimum and the maximum points related to the tests and home works can be obtained are the follows:

Tests:				
1. Test:	Maximum:	100 points	Minimum:	60 points
2. Test:	Maximum:	100 points	Minimum:	60 points
Homework:				
1. Homework:	Maximum:	20 points	Minimum:	10 points
2. Homework:	Maximum:	20 points	Minimum:	10 points
3. Homework:	Maximum:	20 points	Minimum:	10 points
4. Homework:	Maximum:	20 points	Minimum:	10 points
5. Homework:	Maximum:	20 points	Minimum:	10 points
	Sum:	100 points		50 points
Summa points:	Maximum:	100 points		61 points

Where Summa = 45% of sum points of the 2 tests + 10% of sum points of the 5 Homework tasks/

If the score of the test is below 60, the student once can take a retake test covering the whole semester material:

(score/grade): 0-60 % = fail (1); 61-70 % = pass (2); 71-80 % = satisfactory (3); 81-90 % = good (4); 91-100 % = excellent (5).

The course ends with oral exam.

Introduction to Water Engineering

Code: MK3VIZ2S6SX17-EN

ECTS Credit Points: 6

Evaluation: exam

Year, Semester: 3rd year, 5th semester

Its prerequisite(s): Hydraulics & Hydrology I.

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Water engineering refer to water management and hydraulic structures. Hydraulic structures are engineering structures constructed for the purposes of harnessing and using water resources (groundwater, surface water, lakes, sea, etc.) or for the prevention of the negative and destructive actions (floods, shore erosion, etc.) of water on the surrounding environment. There are a large variety of hydraulic structures to serve the many water management purposes for which water resources are put to use. Main topics are Classification of hydraulic structures by purpose and types; Site selection factors; design of gravity dams; classification of reservoirs. Also case studies in different water management issues - water resources

management, excess water problems, flood management, settlement-scale water management issues, thermal water management, water quality control management, etc. - are discussed.

The series of lectures are based on the relevant standards.

This course presents basic technical parameters of water public work, water consumption and its features. Water resources in Hungary (in Europe). Water quality and water classification. Physical, chemical and biological parameters. Water supply system. Water distribution system, network. Types of sewers. Estimating wastewater flow. Sewer design. Storm water inlets. Manholes.

The basic designing instructions are presented for public utilities (pressure water system, sewer system).

Literature:

Compulsory:

- P. Novak, A.I.B. Moffat, C. Nalluri, R. Narayanan, Hydraulic Structures, Fourth Edition, ISBN 13:978-0-415-38625-8
- Jonathan T. Ricketts, M. Kent Loftin, Frederick S. Merritt, Standard Handbook for Civil Engineers, McGraw-Hill Publishing Company, 2003; ISBN 0-07-136473-0
- Downloaded course material

Recommended:

- WFD (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy)

Schedule

1st week Registration week	
2nd week: Lecture: the aim of water management; the impacts of climate change on water management; the relation between water management and hydraulic structures; the aim and technical measures of harnessing and using water resources Practice: issuing the task: study of one specific river basin management plan from given aspects	3rd week: Lecture: the aim and technical measures of the prevention of negative water related events in plain areas; the aim and technical measures of irrigation Practice: examples for technical measures of harnessing and using water resources; examples for technical measures of prevention of floods and excess water in plain areas; issuing the task 2:open channel design
4th week: Lecture: the aim and technical measures for the prevention of negative water related events in hilly areas	5th week: Lecture: urban water management issues; technical measures of artificial recharge of groundwater Practice: examples for special cases like thermal water management, sewerage of

Practice: examples for technical measures for erosion and flood control in hilly areas; issuing the task 4: check dam design	small settlements, storm water management, etc.
6th week:	**7th week:**
Lecture: classification of hydraulic structures by purpose and types	**Lecture:** environmental impacts of water management measures; sustainability issues
Practice: examples and case studies for purposes and types of hydraulic structures	**Practice:** examples for environmental impacts of existing water management measures; submission of tasks
8th week: 1st drawing week	
9th week:	**10th week:**
Lecture: The main features of public works. Water resources group. The water consumption.	**Lecture:** Water quality and classification, water treatment-purification process. Designing (dimension) the pressure water system.
Practice: issuing the task 1: Designing the pressure water system and sewer system. Drawing the general plan. Consultation.	**Practice:** Longitudinal section. Practicing the presentation methods.
11th week:	**12th week:**
Lecture: Modelling of the water system. General prescriptions for dimensioning, choosing basis surfaces. Conventional dimensioning methods.	**Lecture:** Group the sewer systems. Combined sewer system and separated sewer system. Pressure sewer system, vacuum sewer system.
Practice: Applying the dimensioning methods to dimensioning parts. Longitudinal profile.	**Practice:** Consultation.
13th week:	**14th week:**
Lecture: Dimension methods of the waste water system.	**Lecture:** Building of water supply system, sewer system. Manholes in the sewer system.
Practice: Applying the dimensioning methods to dimensioning parts.	**Practice:** Consultation and submission of drawing tasks.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice** is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. Students can't make up a practice class with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the

course to each practice. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

Students have to **submit all the two drawing tasks** as scheduled minimum at a sufficient level.

Students have to **submit the task** on time at a sufficient level.

During the semester there is one test in the 7th week. Students have to sit for the tests. If the score of the test is below 30%, the student once can take a retake test covering the whole semester material.

B, for a grade:

The course ends in a colloquium. Based on the average of the marks of the drawings and the test results, the grade is calculated as an average of them:

- average grade of the two drawing tasks
- the grade of one test

The minimum requirement for the test is 60%. Based on the score of the test, the grade for the test is given according to the following (score/grade): 0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5).

If the score of the test is below 60, the student once can take a retake test covering the whole semester material.

Construction Materials

Code: MK3EPA1S6SX17-EN

ECTS Credit Points: 6 credits

Evaluation: exam

Year, Semester: 2nd year, 3rd semester

Its prerequisite(s): Civil engineering orientation

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+2

Topics:

The lectures are focused on the material properties of construction materials. It reviews the manufacturing and the requirements of different construction materials and those components. Basic topics are the following: Design of aggregate and normal concrete (concrete recipes). New concrete technologies (SFRC, SCC, HSC). Recycling of concrete. Steel. Load bearing glasses. Ceramics. Plastics. Wooden materials, etc. The presentations are connected with laboratory tests of construction materials. Glass as building material (types of glasses and properties of different glass types, mechanical and physical properties of glass, introduction in possibilities of creating load bearing glasses.). Wooden materials in building

industry, mechanical and hydro-technical properties (laboratory testing of wood, effect of fiber direction on properties of wood, force-deflection diagrams, determination of Young's modulus etc.). Steel in engineering applications. Mechanical properties of hot and cold formed steels. Stress-strain diagrams. Effect of carbon content on forming and welding of steel. Laboratory tensile testing of steel (reinforcement). Hardness of steel. Effect of temperature on the external work of steel (Charpy-hammer tests). Alloys. Plastics in engineering applications. Organic binder materials (bituminous materials). Ceramic. History of ceramics. Strength and durability of ceramic materials. Laboratory compression tests of bricks.

Literature:

Compulsory:

- Stephen Timoshenko (1955): Strength of Materials: Elementary Theory and Problems, Van Nostrand
- Hegger M., Auch-Schwelk V., Fuchs M., Rosenkranz T. (2006): Construction Materials Manual, Birkhäuser Edition Detail, ISBN 3-7643-7570-1
- Kind-Barkauskas, Kauhsen, Polonyi, Brandt. (2002): Concrete Construction Materials Manual, Birkhäuser Edition Detail, ISBN 3-7643-6724-5

Recommended:

- Pankhardt, K. (2012): Load bearing glasses, LAP Lambert Academic Publishing, ISBN 978-3-8473-2191-0
- Schulitz, Sobek, Habermann W.: Steel Construction Manual, ISBN 3-7643-6168-6, Birkhäuser Publishers, Basel, (2000)
- Herzog T., Natterer J., Schweizer R., Volz M., Winter W. (2004): Timber Construction Manual, Birkhäuser Edition Detail, ISBN 3-7643-7025-4
- Pfeifer G., Ramcke R., Achtziger J. et. al. (2001): Masonry Construction Manual, Birkhäuser Basel, ISBN: 978-3-7643-6543-1
- Hegger M., Auch-Schwelk V., Fuchs M., Rosenkranz T. (2006): Construction Materials Manual, Birkhäuser Edition Detail, ISBN 3-7643-7570-1
- Schultz H. C., Sobek, W., Haberman K.J. (2000): Steel Construction Manual, Birkhäuser Publishers, ISBN 3-7643-6181-5
- Herzog T., Natterer J., Schweizer R., Volz M., Winter W. (2004): Timber Construction Manual, Birkhäuser Edition Detail, ISBN 3-7643-7025-4
- Schittich, C., Staib, G., Balkow, D., Schuler, M., Sobek, W. (1999): Glass Construction Manual, Birkhäuser Publishers, Basel, ISBN 3-7643-6077-1
- Knippers J., Cremers J., Gabler M., Lienhard J., (2012): Plastic and Membranes Construction Manual, Birkhäuser Architecture, ISBN: 978-3-0346-0726-1

Schedule

1st week Registration week

2nd week: **Lecture:** Basic definitions. History of construction materials. Development of construction materials. Grouping of construction materials. Rheology of materials. Idealisation diagrams. **Practice:** Weight, density of solid and liquid type materials. Discussing the homework topics.	3rd week: **Lecture:** Aggregates. Sieve curve. Sieve curve design. Inorganic binder materials. **Practice:** Aggregates. Sieve curve design. Curing of binder materials
4th week: **Lecture:** Modifiers. Concrete mix-design. Properties of fresh concrete. **Practice:** Consistency of fresh concrete	5th week: **Lecture:** Hardened concrete properties, Durability of concrete. **Practice:** Determination of compressive strength of concrete with laboratory measurements with classification.
6th week: **Lecture:** Mortars. Classification of mortals. Masonry. Plasters. Bedding and covering mortals. Surface and wall-forming mortals. Waterproof cement mortar. Special-purpose mortals. Special concrete. (Mass concrete, fiber, recycled, lightweight concrete, self-compacting, high strength, looking ...) **Practice:** Special concrete (four kinds of mix / break). Distribute of homework: small expertise: The use of construction materials through good and bad examples shown.	7th week: Study trip
8th week: 1st drawing week / 1st test	
9th week: **Lecture:** Wooden materials in building industry, mechanical and hydro-technical properties **Practice:** Effect of fibre direction on properties of wood, force-deflection diagrams, determination of Young's modulus etc.	10th week: **Lecture:** Plastics. The properties of plastics. The use of special plastics. Composites, for example glass-fiber reinforced plastic, tarpaulins. **Practice:** PVC, PE, PP, fire resistance, chemical resistance. Presentation of composite, fiber-reinforced plastics, such as glass, carbon fiber materials. Insulation systems. Heat, water, - sound insulation materials and their requirements. Paints. Opacity, layer thickness, coverage.

11th week: **Lecture:** Steel in engineering applications. Mechanical properties of hot and cold formed steels. Stress-strain diagrams. Effect of carbon content on forming and welding of steel. Effect of temperature on the external work of steel. **Practice:** Laboratory tensile testing of steel (reinforcement). Hardness of steel.	**12th week:** **Lecture:** Ceramic. History of ceramics. Strength and durability of ceramic materials. **Practice:** Laboratory compression tests of bricks.
13th week: **Lecture:** Glass as building material (types of glasses and properties of different glass types, mechanical and physical properties of glass, introduction in possibilities of creating load bearing glasses.) **Practice:** Bending tests of float glasses.	**14th week:** Study trip
15th week: 2nd drawing week / 2nd test	

Requirements

A. **For a signature:**

Participation at **lectures** is **compulsory**. Students must attend on lectures and may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring the calculator and the printed materials of the lectures to each lecture and practice. Active participation is evaluated by the teacher in every class. Active student's participation should be required.

Students have to submit all the laboratory tasks as scheduled minimum at a sufficient level. During the semester there are two tests – the 1st test in the 8th week and the 2nd test in the 15th week – and there is one homework task. In order to take the signature minimum points of the test and the homework task has to be taken, and submit all the laboratory tasks.

B. **For an exam grade:**

In order to take the exam grade – minimum (2) pass grade, – minimum point of test and homework task and written exam has to be taken (Summa minimum 61 points from 100 points). The minimum and the maximum points related to the tests and homework and exam can be obtained are the follows:

Tests:				
1. Test:	Maximum:	**20 points**	Minimum:	**12 points**
2. Test:	Maximum:	**20 points**	Minimum:	**12 points**
	Summa: **40 points**			**24 points**

Homework:				
Homework:		Maximum:	**10 points**	Minimum: **6 points**
Written exam:	Maximum:	**50 points**		**30 points**
Summa points:	Maximum:	**100 points**		**60 points**

The course ends with an **exam grade**. Based on the summa points of the tests and the points of the homework and points of the written exam, the final grade is defined according to the following calculation: 0-60 = fail; 61-70 = pass (2); 71-80 = satisfactory (3); 81-90 = good (4); 91-100 = excellent (5).

Geotechnics I

Code: MK3GTH1S6SX17-EN

ECTS Credit Points: 6

Evaluation: exam grade

Year, Semester: 2rd year, 4th semester

Its prerequisite(s): Civil Engineering Orientation, Strength of Materials

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+2

Topics:

The main aim of the course to give a global perspective and understanding of geological and geotechnical processes specifically tailored to students majoring in engineering. Topics includes: plate tectonic movements; the interactions between the solid earth, hydrosphere and atmosphere; the formation and identification of important mineral and rock materials that make up the surface of the Earth; why volcanoes and earthquakes occur; what determines their locations; what are the major milestones in the evolution of the Earth and what is the local geologic history of Hungary. Soil mechanical explorations, methods, and tools. Soil physics, particle size distribution, phase relations. Natural water content, and consistency limits (shrinkage, plastic, saturation, liquid). Indexes (plasticity, consistency). Compaction and Proctor test. Classification of soil. Strength, stresses in the soil at failing. Water in the soil. Effective and neutral stresses. Overburden pressure. Flow of water through soil due gravity (Darcy's law, coefficient of permeability, flow nets). Shear strength of soil (Mohr-Coulomb failure criterion).

The course is supposed to provide students with necessary knowledge to be able to participate in engineering geological and geotechnical field and laboratory research upon obtaining their bachelor's degree.

Literature:

Compulsory:

- Kezdi, A.: Soil Mechanics
- Bell, F. G.: Engineering geology. 2nd edition, Elsevier, 2007. ISBN-13: 978-0-7506-8077-6; ISBN-10: 0-7506-8077-6

Recommended:

- Bell, F. G.: Fundamentals of engineering geology. Butterwords, London, 1983.
- Blyth, F. G. H.; Freitas, M. H.: A geology for engineers. 7th edition, Elsevier, 1984. ISBN 0 7131 2882 8
- Xiao, Ming: Geotechnical engineering design. Blackwell Publishers (Wiley), 2015. ISBN-13: 9780470632239; ISBN-10: 0470632232
- Bell, F. G.: Geological hazards. Taylor&Francis. ISBN 0-419-16970-9
- Sivakugan, Nagaratnam; Shukla, Sanjay Kumar; Das, Braja M.: Rock mechanic. And introduction. Taylor&Francis. 2015. ISBN-13: 9780415809238; ISBN-10: 0415809231
- Thomson, G.R. and Turk, J.: Modern Physical Geology, Sounders College Publishing, a division of Holt, Rinehart and Winston Inc., Orlando FL, 1991
- Atkinson, J.: The Mechanics of Soils and Foundations. Taylor and Francis, London, 2007.
- Powrie, W.: Soil Mechanics Concepts and Applications (Third edition) CPR Press, Boca Raton, London, New York, 2014
- Craig, R. F.: Craig's Soil Mechanics. Spon Press, Taylor and Francis Group, London, 2004.
- Kempfert, H. G., Gebreselassie, B.: Excavations and Foundations in Soft Soils. Springer, 2006
- Lambe, J., Whitman, G.: Soil mechanics, SI-Version. John Wiley and Sohn, New York, 1979.

Schedule

1st week Registration week	
2nd week: **Lecture:** Earth sciences and geotechnics. Origin of the Solar System and the Earth. The structure of the Earth, plate tectonics, magmatism and volcanism, rock cycle. Concepts of mineralogy and geology. Ingeous rocks (origin, types and features). **Practice:** Basics of mineralogy. Identifications of minerals. Characterization of most important rock forming minerals. Identification and characterization of igneous rocks.	**3rd week:** **Lecture:** Origin of sedimentary rocks. Weathering. Clastic, chemical-biogenic, chemical and biogenic sedimentary rocks. Classification, characterisation. Metamorphic rocks. **Practice:** Identification of and characterization of sedimentary and metamorphic rocks. Building stones, rocks as construction raw materials.
4th week:	**5th week:**

Lecture: Basics of structural geology, plastic and fractured deformation in the Earth crust. Historical geology, stratigraphy, Earth history. Regional geology of the Earth. Endogene and exogene processes (volcanism, earthquakes, mass movements, ground subsidence, erosion, abrasion etc.)

Practice: Methods and sources of geological data collection. Geological sections and maps and their editing.

Lecture: Site investigation methods (indirect and direct), augering, drilling and sampling of soils and rocks. Basic mineralogical laboratory tests. Groundwater and its types, aquitards, aquicludes and aquifers. Groundwater movement. Wells.

Practice: Presentation of augering and soil sampling methods. Geological and hydrogeological databases and their usage. Engineering geological maps.

6th week:

Lecture: Basic rock mechanics. Rock strength and discontinuities. Rock mass classification methods and their application. Engineering geology and mapping.

Practice: Case studies

7th week:

Lecture: Soil particle sizes and distribution.

Midterm test.

Practice: Presentation of sieving and hydrometring. Editing of distribution curve.

8th week: 1st drawing week

9th week:

Lecture: Hydrometer analyses. Parameters of the particle size distribution curve. Phase, weight-volume relationships of soils.

Practice: Calculating of phase, weight and volume ratios of soils. Density and bulk density of soils. Proctor test. Editing of Proctor curve.

10th week:

Lecture: Index tests and classification of soils. Shrinkage, plastic, saturation and liquid limits. Shrinking and swelling. Linear shrinkage and swelling pressure. Soil compaction. Proctor test.

Practice: Testing of Atterberg limits. Calculation of limits and relating indexes.

11th week:

Lecture: Stress in soils (total, effective, and neutral). Overburden pressure. Mohr/Coulomb failure criteria.

Practice: Classification and qualification of soils (usage, compaction etc.). Practical calculations of compaction, phase, weight and volume ratios.

12th week:

Lecture: Soil mechanics parameters describing the strength of the soil (internal friction and cohesion). Laboratory tests describing these parameters.

Practice: Presentation of various (unaxial, triaxial, direct shear etc.) soil strength tests, relating calculations.

13th week:

Lecture: Prestress of the soil. Overconsolidation ratio (OCR). Critical state

14th week:

theory. Cam Clay model and related soil mechanics parameters. **Practice:** Vertical stress calculations (included total stress, pore water pressure and effective stress).	**Lecture:** Deformation of soil. Oedometer test. 1D compressional moduli. End of semester test. **Practice:** Consultation in connection with drawing project.
15th week: 2nd drawing week / 2nd test	

Requirements

A, for a signature:

Attendance: Participation at lectures is critical to successful completion of this course. For the laboratory/problem solving classes the participation is compulsory. More than 3 unexcused absences result incompletion of the course. There are no make-up labs with another group. Tests and oral exam questions will be covered in lectures. Making lecture notes is critical to complete the course.

B, for a grade:

Completion of the course: Submitting the laboratory reports and the homework assignments. Participating at least 70% at laboratory/problem solving. D or higher grades for both tests. There is one make up test for each. Grading of tests: 0-60 = fail; 61-70 = pass (2); 71-80 = satisfactory (3); 81-90 = good (4); 91-100 = excellent (5). Grading of the course:

Mid-term test 20%

End of semester test 20%

Final (verbal exam) 60%

Oral exam is taken at the end of the semester in the exam period. Students have to sign up for the scheduled exam in the Neptun System minimum two days in advance.

Geotechnics II

Code: MK3GTH2S6SX17-EN

ECTS Credit Points: 6

Evaluation: exam grade

Year, Semester: 3rd year, 5th semester

Its prerequisite(s): Geotechnics I.

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Standards and codes of practice in geotechnical engineering. Soil compressibility, consolidation, and settlements. Engineering soil properties and their measurement. Understanding and preparing soil mechanics reports and recommendation.

Stresses in the infinite half-space at rest, plastic equilibrium in soils. Earth pressure determination, active and passive earth pressure situations. Slope stability analysis resistance, non-cohesive and cohesive land mass analysis, vertical stability of earth walls. Supporting land of permanent and temporary structures (retaining walls, gabions, reinforced soil structures, traditional bracing Siemens bracing, sheet piling, bracing modern systems). Earthworks drainage (surface and subsurface drainage, work trenches, drainage trenches and work spaces, advanced dewatering processes). Earthworks design (design works, earth works in calculating the quantity, distribution of land masses). Construction of earthworks and earthmoving. Earth-moving machinery.

Scope of earth works. Plastic limit states, Rankine earth pressures. Earth pressure and passive resistance of real" walls. Soil static design of retaining structures. Stability of earth works.

Literature:

Compulsory:

- Kezdi, A.: Soil Mechanics

Recommended:

- Bell, F. G.: Engineering Geology and Construction. Taylor and Francis, London, 2004.Hausmann, M.: Engineering principles of ground modification. Mc Graw – HillPublishing Company, New York, 1986.
- Kempfert, H. G., Gebreselassie, B.: Excavations and Foundations in Soft Soils. Springer,2006
- Koerner, R. M.: Designing with Geosynthetics. Prentice Hall, Englewood Cliffs, 2005.
- Atkinson, J.: The Mechanics of Soils and Foundations (Second edition), Taylor and Francis, London and New York, 2007
- Powrie, W.: Soil Mechanics Concepts and Applications (Third edition) CPR Press, Boca Raton, London, New York, 2014 1. Look, B.: Handbook of geotechnical investigation and design tables. Taylor and Francis, London, 2007.
- Lunne, T., Robertson, P. K., Powell, J. J. M.: Cone penetration testing in geotechnical practice. Spon / Routledge, London, New York, 2002.
- Terzaghi, K.: Theoretical soil mechanics. John Wiley and Sons, New York, 1943.
- Terzaghi, K., Peck, R.: Soil mechanics in engineering practice. John Wiley and Sons,New York, 1943.
- Whitlow, R.: Basic soil mechanics. Longman Scientific and Technical, 1990.

Schedule

1st week Registration week	
2nd week: **Lecture:** Filter criteria. Self-filtering. Ground freezing. Capillarity. Seepage pressures and hydraulic failing. **Practice:** Presentation of in-situ and laboratory permeability testing methods (constant and falling head laboratory apparatus, infiltrometer methods, pumping test in wells). Calculation of hydraulic conductivity used by empirical formulas. Calculation of groundwater flow. Editing of flow net. Assessment of capillary rise.	3rd week: **Lecture:** Liquefaction. Ground water. Yearly cycle of the water table at continental climate. Predicting the characteristic value of ground water level. **Practice:** Presentation of oedometer test procedure. Editing of compression curve and consolidation curve. Calculation of the 1D compression moduli. Determining of preconsolidation pressure, compression and recompression index.
4th week: **Lecture:** Soil explorations. Site investigations, boring and sampling. Soil mechanics report. Contents and drawing supplements (Plan view, Borehole log, cross section.). **Practice:** Field presentation of drilling, hand-augering, soil sampling, groundwater sampling, dynamic penetrometer testing and vane shear test.	5th week: **Lecture:** Determination of cross-section area and calculating the volume of soil. Diagram and the distribution of masses. Parameters, factors for design of slopes. Types of instability of slopes. Stress change on slopes. **Practice:** Evaluation of laboratory testing results. Assessment of soil physical parameters by empirical formula. Qualification of soils (using for earthworks, compaction, frostbite, etc.). Evaluation of field test results (dynamic penetrometer, cone penetration test, vane shear test).
6th week: **Lecture:** Influence of water on the stability of slopes. Stability of infinite slopes. Influence of seepage on the stability. Stability of vertical cut. Design of simple excavations. **Practice:** Calculation of characteristic values of soil mechanical parameters. Writing of geotechnical site investigation report. Editing of soil mechanical log, and cross section.	7th week: **Lecture:** The compaction process. Relevant laboratory and field testing for soil properties and compaction. Compaction equipment; application for various materials. Quality control and testing requirements Midterm test. **Practice:** Consultation about drawing project.
8th week: 1st drawing week	

9th week:

Lecture: Lateral earth pressure at rest. Rankine's lateral earth pressures (active, passive). Earth pressure with sloping backfill. Graphic solution for Coulomb's active earth pressure (Culmann's solution). Active and passive force with earthquakes force. Calculating the earth pressures for drained and undrained loading.

Practice: Concepts and general features of earthworks. Long and cross sections, volume calculations. Soil suitability.

10th week:

Lecture: Type of retaining structures (Gravity walls, cantilever walls, anchored or propped walls). Pressure on retaining wall due to surcharge. Failure of retaining walls. Dewatering and filtering systems of retaining walls.

Practice: Calculation of lateral earth pressure (at rest, active and passive state) in non-cohesive and cohesive soils.

11th week:

Lecture: Mechanism based kinematic and equilibrium solutions for gravity retaining walls. Soil strength and factors for design of retaining walls. Stress changes in soil near retaining walls. Influence of water on retaining walls. Reinforced soil walls. Compaction stresses.

Practice:

Slope stability investigation in homogeneous soil using friction circle method.

12th week:

Lecture: Dewatering during construction. sump and ditches; deep-well, well-points (conventional and vacuum), horizontal drainage. Well theory. Confined aquifer (full, partial penetration well). Group wells. Filter design (Terzaghi's criteria)

Practice: Stability analyses of gravity retaining walls.

13th week:

Lecture: Cut offs (Cement and chemical grout curtains; Slurry walls; Concrete walls; Steel sheet piling; Freezing) Pumping test. Discharge, environmental problems. Additional settlement from the reduction of water table.

Practice: Stability analyses of sheet piles.

14th week:

Lecture: Summary. Preparation for the test. End of Semester test.

Practice: Consultation with the assigned design projects.

15th week: 2nd drawing week

Requirements

A, for a signature:

Attendance: Participation at lectures is critical to successful completion of this course. For the laboratory/problem solving classes the participation is mandatory. More than 3 unexcused absences result in no completion of the course. There are no make-up labs with another group. Tests and oral exam questions will be covered in lectures. Making lecture notes is critical to complete the course.

B, for a grade:

Completion of the course: Submitting the laboratory reports and the Home Work assignments. Participating at least 70% at laboratory/problem solving. D or higher grades for both tests. There is one make up test for each. Grading of tests: 0-60 = fail; 61-70 = pass (2); 71-80 = satisfactory (3); 81-90 = good (4); 91-100 = excellent (5).

Grading of the course:

Mid-term test 15%

End of semester 15%

Slope stability HWA10%

Retaining wall HWA 10%.

Final (verbal exam) 50%

An oral exam is taken at the end of the semester in the exam period. Students have to sign up for the scheduled exam minimum two days in advance.

Geotechnics III

Code: MK3GTH3S6SX17-EN

ECTS Credit Points: 6

Evaluation: exam grade

Year, Semester: 3rd year, 6th semester

Its prerequisite(s): Geotechnics II.

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Construction of earth works (design, building and monitoring). Geosynthetics.

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.

History of deep foundation. Load bearing capacity of foundations. Effect of the surrounding soil/rock. Load transmitting systems. Piling techniques, examples. Designing of piles and pile groups. Building and designing of diaphragm walls. Diaphragm wall boxes. Design aspects of underground garages. Underpasses. Pipe bursting. Lining materials and techniques of underground structures. Soil improvements.

Literature:

Recommended:

- Chang-Yu Ou: Deep Excavations. Taylor and Francis, London, 2006.
- Dandy, G., Walker, D., Daniell, T., Warner, R.: Planning of Engineering Systems. Taylor and Francis, London, 2006.
- Fang, H. S.: Foundation Handbook. Chapman and Hall, New York, 1990.
- Fang, Hsai, Yand, Daniels, J. B: Introductory Geotechnical Engineering. Taylor and Francis, London, 2006.
- Lancelotta, R.: Geotechnical Egineering. Balkema. Rotterdam, Brookfield, 1995.
- Mitchell, J. K. Fundamentals of soil behaviour, John Wiley and Sons, New York, 1976.
- Moseley, M. P., Kirsch, K. ed. Ground Improvement. Taylor and Francis, London, 2004.
- Tomlinson, M. J.: Foundation design and construction.n. Pearson Education, Harlow,2001.
- Atkinson, J.: The Mechanics of Soils and Foundations (Second edition), Taylor and Francis, London and New York, 2007
- Powrie, W.: Soil Mechanics Concepts and Applications (Third edition) CPR Press, Boca Raton, London, New York, 2014
- Das, B.M. (2006) Principles of Geotechnical Engineering, 7th or 8th Editions, Thomson Publishing (limited chapters)
- Duncan, J.M. and Wright, S.G., Soil Strength and Slope Stability, 2005 Wiley

Schedule

1st week Registration week	
2nd week: **Lecture:** Geosynthetics. Design of gesyntetic filters. **Practice:** Syllabus, polices, introduction.	3rd week: **Lecture:** Types of foundations. Shallow strip foundations (footings). Concept of upper and lower bound solutions. Simple lower bound (safe) and upper bound (unsafe) solutions. Undrained analyses (simple circular arc, theories of Prandl and Reissner). Drained analyses (Terzaghi's theory) **Practice:** Shallow foundation HWA (I/1)
4th week: **Lecture:** Bearing capacity enhancement factors to account for shape, depth and weight. Bearing capacity of homogeneous and layered soils. The effect the water table. Shallow foundations subject to horizontal and moment loads. **Practice:** Shallow foundation HWA (I/2)	5th week: **Lecture:** Soil structure interaction principles. Contact pressure distribution. Factors influencing contact pressure distribution beneath rigid and flexible footings. Concentrically and eccentrically loaded cases. **Practice:** Shallow foundation HWA (I/3)

6th week: **Lecture:** Idealized elastic soil behaviour. Stress distribution under the foundation. Consolidation theories. Settlement analysis of shallow foundations on clay and sand. **Practice:** Shallow foundation HWA (I/4)	7th week: **Lecture:** Balancing bearing capacity and settlement in design. Allowable total and differential settlement of structures. Raft foundations. Heave and settlement of foundations due to changes of groundwater. Midterm test. **Practice:** Settlement estimation HWA (II/1)
8th week: 1st drawing week	
9th week: **Lecture:** Fundamentals of Deep Foundations. Pile Foundations. Pile types. Pile driving and allowable stresses. Construction, inspection, specifications and case histories. **Practice:** Settlement estimation HWA (II/2)	10th week: **Lecture:** Structural issues and design. Drilled Shaft Foundations. Other types of foundations (micropiles, helical anchors, anchors, soil nails etc.) Static Capacity Design of Deep Foundations. **Practice:** Settlement estimation HWA (II/3)
11th week: **Lecture:** Soil-Structure Interaction for Deep Foundations. Axial loading of deep foundations. Base resistance of a single pile. Lateral Loading of deep foundations. Load testing of deep foundations. Static analyses of piles and drilled shafts in clays and in sand. Time dependency of capacities. Field Load Testing of Foundations. **Practice:** Piled foundation HWA (III/1)	12th week: **Lecture:** Pile testing and driving formulas. Wave equation analyses. Capacity of pile groups. Special foundations. Foundation design in relation to ground movements. Foundation on recent refuse fills. Design of Foundation for seismic forces. Special problems with foundations on swelling soils. **Practice:** Piled foundation HWA (III/2)
13th week: **Lecture:** Case studies of failed foundations. Fracture and settlement analyses of the case studies. **Practice:** Piled foundation HWA (III/3)	14th week: **Lecture:** Preparation/instructions for the test and for the verbal exam. End of Semester test. **Practice:** Consultation with the assigned design projects.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance: Participation at lectures is critical to successful completion of this course. Participation is compulsory at the laboratory/problem solving classes. More than 3 unexcused absences result incompletion of the course. There are no make-up labs with another group.

Tests and oral exam questions will be covered in lectures. Making lecture notes is critical to complete the course.

B, for a grade:

Completion of the course: Submitting the laboratory reports and the homework assignments. Participating at least 70% at laboratory/problem solving. D or higher grades for both tests. There is one make up test for each. Grading of tests: 0-60 = fail; 61-70 = pass (2); 71-80 = satisfactory (3); 81-90 = good (4); 91-100 = excellent (5).

Grading of the course:

Mid-term Test 12%

End of semester Test 12%

Shallow foundation HWA 14%

Settlement estimation HWA 12%

Piled foundation HWA 10%

Final (verbal exam) 40%

An oral exam is taken at the end of the semester in the exam period. Students have to sign up for the scheduled exam in the Neptun System minimum two days in advance.

Theory of Transportation & Basics of Urban Planning

Code: MK3KOZ1S6SX17-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Year, Semester: 2nd year, 3rd semester

Its prerequisite(s): Geoinformatics I.

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+0

Topics:

Delivering Public Goods. Collective Action: Balancing Public and Particularistic Interests. Urban Planning and Regulation: The Challenge of the Market. The Evolution of the Institutional Approach in Planning. Varieties of Planning Experience. *Principle and Goals:* beauty, sustainability, justice, access, preservation, cultural diversity, resilience. *Plan Making.* Making Plans. Planning Case Studies. Visualizing Information. Modelling Urban Systems. Codes and Standards. *Frontiers of Persistent and Emergent Questions.* Urban Planning and Public Health. Suburban Sprawl and Smart Growth. Air Quality and Environmental Health. The Local Regulation of Climate Change. Housing: Planning and Policy Challenges. The Public Finance of Urban Forum. *Planning Agents.* The Civics of Urban Planning. Urban Informality. Citizen

Planners. The Real Estate Development Industry. The Policy of Planning. Planning and Citizenship.

Transportation system. Tasks, characteristics and development of transportation systems. Main goals of transportation development. The process of road design. Alignment of roads. Views of alignment. Travel need, reasons and consequences of mobility. Travel modes. Modal split. Traffic surveys. Sustainable transport modes. Definition, energy consumption. Capacity, capacity usage. Definition and criteria of Level of Service. Determination of traffic demand. Traffic operation. Relationships among basic traffic parameters. Design and operational analysis.

Literature:

Compulsory:

- Weber, R. & Crane, R. (Eds.), 2012: The Oxford Handbook of Urban Planning. Oxford University Press, Oxford. ISBN 978-0-19-023526-0
- Bayer, M., Frank, N. & Valerious, J., 2010: Becoming an Urban Planner. John Wiley and Sons, Hoboken, NJ. ISBN 978-0-470-27863-5
- Knoflacher, H., Ebru, V.: Engineering Tools and Solutions for Sustainable Transportation Planning, IGI global, Hershey, 2017, ISBN 9781522521574
- Rogers M.: Highway Engineering, Blackwell, Oxford, 2003, ISBN 0-632-05993-1

Schedule

1st week Registration week	
2nd week: **Lecture:** *Delivering Public Goods.* Collective Action: Balancing Public and Particularistic Interests. Urban Planning and Regulation: The Challenge of the Market. The Evolution of the Institutional Approach in Planning. Varieties of Planning Experience.	**3rd week:** **Lecture:** *Principle and Goals:* beauty, sustainability, justice, access, preservation, cultural diversity, resilience.
4th week: **Lecture:** *Plan Making.* Making Plans. Planning Case Studies. Visualizing Information. Modelling Urban Systems. Codes and Standards.	**5th week:** **Lecture:** *Frontiers of Persistent and Emergent Questions.* Urban Planning and Public Health. Suburban Sprawl and Smart Growth. Air Quality and Environmental Health.
6th week: **Lecture:** *Frontiers of Persistent and Emergent Questions.* Air Quality and Environmental Health. The Local Regulation of Climate Change. Housing: Planning and Policy Challenges. The Public Finance of Urban Forum.	**7th week:** **Lecture:** *Planning Agents.* The Civics of Urban Planning. Urban Informality. Citizen Planners. The Real Estate Development Industry. The Policy of Planning. Planning and Citizenship.

8th week: 1st drawing week	
9th week: **Lecture:** Transportation system. Tasks, characteristics and development of transportation systems. The effect on exploration and development of regions. Main goals of transportation development.	10th week: **Lecture:** The process of road design. Alignment of roads. Requirements of alignment. Views of alignment. Elements of horizontal and vertical alignment.
11th week: **Lecture:** Travel need, reasons and consequences of mobility. Travel modes. Modal split. Traffic surveys. Semester project work discussion.	12th week: **Lecture:** Sustainable transport modes. Definition, energy consumption. Consultation of semester project work.
13th week: **Lecture:** Capacity, capacity usage. Definition and criteria of Level of Service. Determination of traffic demand. Composition of traffic flow. Flow speed and density. Handling of project works.	14th week: **Lecture:** Traffic operation. Relationships among basic traffic parameters. Design and operational analysis.
15th week: 2nd drawing week	

Requirements

Semester project work in the topic of transportation.

Homework: Maximum: **50 points** Minimum: **26 points**

Requirements in the topic of urban planning

Mid-term test: Maximum: **50 points** Minimum: **26 points**

The course ends with **mid-semester grade**. Based on the summa points of the tests and the summa points of the homework, the mid-semester grade is defined according to the following calculation: 0-50 = fail; 51-62 = pass (2); 63-74 = satisfactory (3); 75-86 = good (4); 87-100 = excellent (5).

Planning & Design of Transport Facilities

Code: MK3KOZ2S6SX17-EN

ECTS Credit Points: 6

Evaluation: exam

Year, Semester: 2nd year, 4th semester

Its prerequisite(s): Theory of Transportation & Basics in Urban Planning

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Basics of transportation. Road networks in Hungary. Categories of roads. Parameters of vehicles and highways. Geodesy. Geographical and geotechnical parameters. Dewatering of roads. Horizontal and vertical alignment. Intersections. Sight distances. Road safety. Public transport. Pavements and its materials. Production processes. Bicycle facilities. Sustainable transport modes. Parking facilities. Sustainable transport modes. Definition, energy consumption. Road control systems. Level of service. Classical methods and traffic calming. Traffic operation. Relationships among basic traffic parameters. Design and operational analysis.

Railway parameters. Gauge. Kinetic knowledge. Railway track and rolling stock. Traction and resistance. Transitional geometry in railway motions. Railway substructure elements. Road-rail crossings. Rail points and switches. Railway superstructure concepts. Rails and its production. Welding and rail jointing methods. Sleepers and its usage. Rail ballast. Urban rail superstructures. Rail stations and yards. Track maintenance and construction methods.

Literature:

Compulsory:

- Rogers M.: Highway Engineering, Blackwell, Oxford, 2003, ISBN 0-632-05993-1
- Chandra, Agrawal: Railway engineering, Oxford University Press, 2007, ISBN 978-0-19-568779-8

Schedule

1st week Registration week	
2nd week: **Lecture:** Basics of transportation. Road networks in Hungary. Railway parameters. Gauge. Kinetic knowledge. **Practice:** Contour-map, design parameters. Handling and discussion of semester project work.	**3rd week:** **Lecture:** Categories of roads. Parameters of vehicles and highways. Railway track and rolling stock. Traction and resistance. **Practice:** Contour gradient. Filling, cutting. Cross-section.
4th week: **Lecture:** *Geodesy. Geographical and geotechnical parameters.* *Transitional geometry in railway motions.* **Practice:** Site plan. Curves, straights. Superelevation.	**5th week:** **Lecture:** Dewatering of roads. Horizontal and vertical alignment. **Practice:** Calculation of horizontal curves. Consultation of homework.

6th week: **Lecture:** Intersections. Sight distances. Road safety. Railway substructure elements. Road-rail crossings. **Practice:** Longitudinal sections. Planning parameters.	7th week: **Lecture:** Public transport. Facilities and operation. Rail points and switches. Railway superstructure concepts. Computing design data. **Practice:** Discussion of semester project presentation. Signing for presentation dates.
8th week: 1st drawing week	
9th week: **Lecture:** Pavements and its materials. Production processes. Rails and its production. Welding and rail jointing methods. **Practice:** Consultation.	10th week: **Lecture:** Bicycle facilities. Sustainable transport modes. Design parameters. Sleepers and its usage. **Practice:** Vertical alignment. Consultation.
11th week: **Lecture:** Parking facilities. Design parameters and usage. Rail ballast. Complex examination. **Practice:** Handling of homework. Consultation and preparation presentation of semester project works.	12th week: **Lecture:** Sustainable transport modes. Definition, energy consumption. Urban rail superstructures. **Practice:** Presentation of semester project works.
13th week: **Lecture:** Road control systems. Level of service. Classical methods and traffic calming. Rail stations and yards. **Practice:** Presentation of semester project works.	14th week: **Lecture:** Traffic operation. Relationships among basic traffic parameters. Design and operational analysis. Track maintenance and construction methods. **Practice:** Post-handling of homework. Repetition possibility of semester project handling.
15th week: 2nd drawing week	

Requirements

Homework in in the topic of roads.

Homework: Maximum: **25 points** Minimum: **13 points**

Semester project work in the topic of railways.

Homework: Maximum: **25 points** Minimum: **13 points**

The signature is valid if the student reaches 26 points. No sign under 26 points.

The course ends with an exam. On the exam another 50 points can be achieved. Based on the summa points of the homework and the summa points of the exam, the grade is defined according to the following calculation: 0-50 = fail; 51-62 = pass (2); 63-74 = satisfactory (3); 75-86 = good (4); 87-100 = excellent (5).

Theory of Design & Approximate Calculations

Code: MK3TAR1S4SX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 4th semester

Its prerequisite(s): Strength of Materials

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+0

Topics:

Reviewing the basic knowledge of mechanics and mathematics. Tasks of mechanics and mathematics. Discussing the Eurocode standard. Building and supporting structures. Forms of failure. Modelling Issues. Ways of building. Idealized support, support types, hierarchical structure, a two-dimensional structural model. Theory of building design basics. The capacity, safety, risk, life, the concept of reliability; strength and stability. The primary structural systems, deconstructing, contacts, supports. Demonstrating them on simple buildings. Weight; inclusion of standard payload. Examples to weight analysis, the dead load and determine the payload. Meteorological loads: snow load, wind load. Examples of weight analysis, the dead load and the live load. Snow load and wind load determination. The effect of temperature change. Loads under construction; extraordinary loads, fire effects. Examples of the determination of charges under construction. Different load conditions. Standard load combinations. Examples of standard load combinations. State of emergencies. Calculation in case of complex structures and load combinations.

Literature:

Compulsory:

- MSZ-EN-1990-2002/A1 Eurocode
- MSZ-EN-1991-1-7 Eurocode
- MSZ-EN-1998-1 Eurocode
- Gulvanessian, H., Formichi P., Calgaro J-A.: Designers' Guide to Eurocode 1: Actions on Buildings, Thomas Telford Publishing, , 2009, ISBN 978-0727731562

Schedule

1st week Registration week	
2nd week: Lecture: Introduction. Reviewing the basic knowledge of mechanics and mathematics. Training Tasks of mechanics and mathematics. Discussing the Eurocode standard.	3rd week: Lecture: Building and supporting structures; supporting structures requirements; its forms of failure. Modelling Issues: Ways of buildings; idealized support, support types, hierarchical structure, a two-dimensional structural model. Training Tasks of mechanics and mathematics.
4th week: Lecture: Theory of building design basics. The capacity, safety, risk, life, the concept of reliability; strength and stability. The primary structural systems, deconstructing, contacts, supports. Demonstrating them on simple buildings.	5th week: Lecture: Constant burden: weight; inclusion of standard payload. Examples to weight analysis, the dead load and determine the payload.
6th week: Lecture: Meteorological loads: snow load, wind load. Examples of weight analysis, the dead load and determine the payload. Examples of snow load and wind load determination.	7th week: Lecture: Wind load, the effect of temperature change. Examples of snow load and wind load determination. Consultation.
8th week: 1st drawing week	
9th week: Lecture: Loads under construction; extraordinary loads, fire effects. Examples of the determination of charges under construction presentation of the impact of fire and earthquakes.	10th week: Lecture: Simultaneity, different load conditions; Preparation of the standard load combinations. Examples of standard load combinations.
11th week: Lecture: Standard load combinations. The dimensioning of structures, specific questions. State of emergencies. Examples of standard load combinations.	12th week: Lecture: Internal forces. Calculation in case of complex structures and load combinations.
13th week: Lecture: Load combinations. Examples and calculation. Mid-term test.	14th week: Lecture: Repetition of mid-term test. Assessment of homework. Closing of semester.
15th week: 2nd drawing week	

Requirements

Obligatory semester project work

Homework: Maximum: 50 points Minimum: 26 points

Obligatory mid-term test

Mid-term test: Maximum: 50 points Minimum: 26 points

The course ends with mid-semester grade. Based on the summa points of the tests and the summa points of the homework assignments, the mid-semester grade is defined according to the following calculation: 0-50 = fail; 51-62 = pass (2); 63-74 = satisfactory (3); 75-86 = good (4); 87-100 = excellent (5).

Steel Structures

Code: MK3TAR2S6SX17-EN

ECTS Credit Points: 5 credits

Evaluation: mid-semester grade

Year, Semester: 3rd year, 5th semester

Its prerequisite(s): Construction Materials, Theory of Design & Approximate Calculations

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+0

Topics:

Steel usage in structural building. Fabrication and installation of steel structures. Failure forms of steel structures. Tensile, compressive, shear and combined resistance of the cross-sections. Stability of structural elements. Design of bars under compression. Design of structural elements under bending. Lateral torsional buckling. Bolted joints of steel structures. Welded joints of steel structures.

Literature:

Compulsory:

- EN 1993-1-1: 2009 Design of steel structures Part 1-1.: General rules and rules for buildings
- EN 1993-1-8: 2005 Design of steel structures Part 1-8.: Design of joints

Recommended:

- Claudio Bernuzzi, Benedetto Cordova, Structural Steel Design to Eurocode 3 and AISC Specifications, Wiley Blackwell, 2016, ISBN 978-1-118-63128-7
- Jean-Pierre Jaspart, Klaus Weynand, Design of joints in Steel and Compoite Structures, Ernst&Sohn, 2016, ISBN 978-3-433-02985-5

Schedule

1st week Registration week	
2nd week: Lecture: Introduction. Steel as structural material. Method of choosing the right steel grade. Frequently used cross –section in steel structures. Fabrication and installation of steel structures. Repetition: Calculation of cross-sectional properties and stress distributions.	3rd week: Lecture: Study tour: Steel structure manufacturing plant + steel structures
4th week: Lecture: Interpretation of cross-sectional classes. Methods of determining effects and resistances depending on the cross-sectional classes. Classification of cross-sections with simple-, or complex loading. Determination of effective cross-sectional area for class4 structural elements.	5th week: Lecture: Structural elements under tension and compression. Cross-sectional resistance. Buckling resistance.
6th week: Lecture: Structural elements under bending. Cross-sectional resistance. Lateral torsional buckling resistance (normal and simplified method).	7th week: Lecture: Structural elements under shear. Shear stresses in thin-walled sections. Shear center. Shear resistance of the cross-section. Shear buckling. Torsion.
8th week: 1st drawing week	
9th week: Lecture: Cross-sections under complex loading. Structural elements under complex loading. (simple cases)	10th week: Lecture: Failure modes of steel structures. Service limit state. Design task (part 1): clarification of the structure, determination of internal forces.
11th week: Lecture: Design task (part 2): design of the structural elements. (Cross-sectional checks, stability checks, checking of SLS.)	12th week: Lecture: Simple bolted joints. Design task (part 3): design of bolted joints.
13th week: Lecture: Simple welded joints. Design task (part 4): design of welded joints.	14th week: Lecture: Test. Consultation.
15th week: 2nd drawing week	

Requirements

Participation at **lectures** is **compulsory**. Students must attend lectures and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring calculator and the printed materials of the lectures with them to each lecture. Active participation is evaluated by the teacher in every class. Students' active participation is required. Students have to **submit the test and the design task** as scheduled minimum at a sufficient level.

A, for a signature:

Student has to reach at least 30 points from the 60 points on the test.

B, for a grade:

Beyond the above a student has to get at least 20 points from the 40 points on the design task. The design task has to be handed in personally. One will get questions about the design task.

The course ends with a mid-semester grade. Based on the summa points of the test and the design task, the mid-semester grade is defined in the following way:

Test:	Maximum:	**60 points**	Minimum:	**30 points**
Homework:	Maximum:	**40 points**	Minimum:	**20 points**
Summa points:	Maximum:	**100 points**		**61 points**

0-60 = fail; 61-70 = pass (2); 71-80 = satisfactory (3); 81-90 = good (4); 91-100 = excellent (5).

Reinforced Concrete Structures

Code: MK3TAR3S4SX17-EN

ECTS Credit Points: 5 credits

Evaluation: mid-semester grade

Year, Semester: 3rd year, 6th semester

Its prerequisites: Construction Materials, Theory of Design & Approximate Calculations

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+0

Topics:

History of concrete and reinforced concrete (RC) structures. Mechanical properties of fresh and hardened (structural) concrete. Mechanical properties of reinforcing bars, welded meshes, materials of prestressing. Corrosion of concrete and reinforcement. Definition of the environmental conditions, environmental or exposure classes, determination of the concrete cover. Bond in concrete. Normal force – elongation relationship for steel bars embedded in concrete. Moment – curveture relationship of RC cross sections. Definition of the state of stresses for RC sections, behaviour of uncracked and cracked section. Resistance of RC cross section in bending. Design of RC cross-section in bending. Shear behaviour of RC members.

Punching shear. Shear problem between web and flanges of T-section. Shear at interface between concretes cast at different times. Torsion of reinforced concrete members. Effect of normal force. Prestressing. Prestressing technologies. Prestressing force loss of prestressing, effective prestressing force. Design of pressed members. Magnet lines. Ultimate moment capacity according to Mörsch. Effect of prestressing on shear. Limit states: design of RC members in ultimate limit states (ULS), analysis of RC members in serviceability states (SLS). Deflection control, crack width control, stress limitation.

Literature:

Compulsory:

- EN 1990:2002/A1:2005 Eurocode - Basis of structural design.
- EN 1991-1-1:2002 Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings.
- MSZ EN 1992-1-1: 2010 Design of concrete structures Part 1-1: General rules and rules for buildings
- MSZ EN 1992-1-2: 2010 Design of concrete structures Part 1-2: General rules. Structural fire design
- MSZ 4798-1:2004 Concrete Part 1: Specification, performance production, conformity, and rules of application of MSZ EN 206-1 in Hungary
- Robert Park & Thomas Paulay: Reinforced Concrete Structures, Wiley-India Edition (2010), ISBN: 978-81-265-2362-5
- Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design Theory and Examples, Taylor & Francis Group (2010), ISBN: 0-415-30796-1
- Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design to Euroceodes – Design Theory and Examples, Taylor & Francis Group (2014), ISBN-13: 978-1-4665-5252-4
- Jack C. McCormac: Design of Reinforced Concrete Fifth Edition, John Wiley &Sons Inc. (2001), ISBN: 0-471-39576-5

Recommended:

- fib Bulletin 51 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 1., Federation International du Béton – International Federation for Structural Concrete, (2009) ISSN: 1562-3610, ISBN:978-2-88394.091-8
- fib Bulletin 52 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 2., Federation International du Béton – International Federation for Structural Concrete, (2010) ISSN: 1562-3610, ISBN:978-2-88394.091-8
- fib Bulletin 53 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 3., Federation International du Béton – International Federation for Structural Concrete, (2009) ISSN: 1562-3610, ISBN:978-2-88394-093-8
- fib Bulletin 54 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 4., Federation International du Béton – International Federation for Structural Concrete (2010), ISSN: 1562-3610, ISBN:978-2-88394-094-9

- fib Bulletin 62 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 5., Federation International du Béton – International Federation for Structural Concrete, (2012) ISSN: 1562-3610, ISBN:978-2-88394-102-1
- A. M. Neville: Properties of concrete Fourth and Final Edition Standarts updated to 2002, Pearson Prentice Hall (2004), ISBN: 0-582-23070-

Schedule

1st week Registration week	
2nd week: Lecture: History of concrete and reinforced concrete (RC) structures. Mechanical properties of fresh and hardened (structural) concrete.	3rd week: Lecture: Mechanical properties of reinforcing bars, welded meshes, materials of prestressing. Corrosion of concrete and reinforcement. Definition of the environmental conditions, environmental or exposure classes, determination of the concrete cover.
4th week: Lecture: Bond in concrete. Normal force – elongation relationship for steel bars embedded in concrete. Moment – curvature relationship of RC cross sections.	5th week: Lecture: Definition of the state of stresses for RC sections, behaviour of uncracked and cracked section.
6th week: Lecture: Resistance of RC cross section in bending. Design of RC cross-section in bending.	7th week: Study trip
8th week: 1st drawing week / 1st test	
9th week: Lecture: Shear behaviour of RC members. Punching shear.	10th week: Lecture: Shear problem between web and flanges of T-section. Shear at interface between concretes cast at different times. Torsion of reinforced concrete members.
11th week: Lecture: Effect of normal force, bending moment normal force interaction. Prestressing.	12th week: Lecture: Eccentricities, buckling length of RC bars, braced and unbraced members, first and second order moments, section design.
13th week: Lecture: Limit states: design of RC members in ultimate limit states (ULS), analysis of RC members in serviceability states (SLS).	14th week: Study trip

Deflection control, crack width control, stress limitation.	

15th week: 2nd drawing week / 2nd test

Requirements

Participation at **lectures** is **compulsory**. Students must attend lectures and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator and the printed materials of the lectures with them to each lecture and practice. Active participation is evaluated by the teacher in every class. Students' active participation is required.

Students have to **submit all the two tests and the five design tasks** as scheduled minimum at a sufficient level.

A, for a signature:

In order to take the **signature** students has to reach the minimum points on the tests and the minimum points on the homework.

B, for a grade:

In order to take the **mid-semester grade** – minimum (2) pass grade, – minimum point of test and design task has to be taken (Summa minimum 61 points from 100 points). In order to take a mid-semester grade – minimum (2) pass grade – minimum point of tests and design tasks has to be taken. The minimum and the maximum points related to the tests and design tasks can be obtained are the follows:

Tests:				
1. Test:	Maximum:	**20 points**	Minimum:	**12 points**
2. Test:	Maximum:	**20 points**	Minimum:	**12 points**
	Summa:	**40 points**		**24 points**

Homework:				
1. Homework:	Maximum:	**8 points**	Minimum:	**5 points**
2. Homework:	Maximum:	**8 points**	Minimum:	**5 points**
3. Homework:	Maximum:	**10 points**	Minimum:	**6 points**
4. Homework:	Maximum:	**10 points**	Minimum:	**6 points**
5. Homework:	Maximum:	**11 points**	Minimum:	**7 points**
6. Homework:	Maximum:	**13 points**	Minimum:	**8 points**
	Summa:	**60 points**		**37 points**
Summa points:	Maximum:	**100 points**		**61 points**

The course ends with a **mid-semester grade**. Based on the summa points of the tests and the summa points of the homework, the mid-semester grade is defined according to the following calculation:

Score			Grade
0 – 60	points:	fail	(no sign)
61 – 70	points:	pass	(2)
71 – 80	points:	satisfactory	(3)
81 – 90	points:	good	(4)
91 – 100	points:	excellent	(5)

Bridges & Civil Engineering Structures

Code: MK3TAR4S4SX17-EN

ECTS Credit Points: 4 credits

Evaluation: exam grade

Year, Semester: 4th year, 7th semester

Its prerequisite(s): Steel structures, Reinforced concrete structures, Geotechnics III.

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 4+0

Topics:

History of bridges. Bridges classes. Norms and preliminary works. Foundations, substructures and equipment. Dilatations. Structure and building techniques of steel bridges. Steel beam bridges. Steel frame, arch and suspension bridges. Orthotropic plates. Structure and building techniques of concrete bridges. Concrete beam, frame and arch bridges. Prestressing techniques. Precast pretensioned girder bridges. Concrete box girders. Structures and building techniques of cable-stayed bridges. Composite and timber bridges. Test loading, monitoring and maintenance and strengthening techniques. Reservoirs, bunkers water-towers.

Literature:

Compulsory:

- M. J. Ryall, G. A. R. Parke, J. E. Harding (2000): The Manual of Bridge Engineering, Thomas Telford
- H. G. Tyrrell (2008): History of Bridge Engineering; Stubbe Press

Recommended:

- fib Bulletin N° 39. Seismic bridge design and retrofit - structural solutions. State-of-art report (300 pages, ISBN 978-2-88394-079-6, May 2007).
- fib Bulletin N° 32. Guidelines for the design of footbridges. Guide to good practice (160 pages, ISBN 978-2-88394-072-7, November 2005).

- fib Bulletin N° 30. Acceptance of stay cable systems using prestressing steels. Recommendation (80 pages, ISBN 978-2-88394-070-3, January 2005)
- fib Bulletin N° 29. Precast concrete bridges. State-of-art report (84 pages, ISBN 978-2-88394-069-7, November 2004).
- fib Bulletin N° 9. Guidance for good bridge design. Part 1 – Introduction. Part 2 – Design and construction aspects. Guide to good practice (190 pages, ISBN 978-2-88394-049-9, July 2000).

Schedule

1st week Registration week	
2nd week: Lecture: History of bridges. Bridges classes.	3rd week: Lecture: Norms and preliminary works.
4th week: Lecture: Foundations, substructures and equipment. Dilatations.	5th week: Lecture: Structure and building techniques of steel bridges. Steel beam bridges.
6th week: Lecture: Steel frame, arch and suspension bridges. Orthotropic plates.	7th week: Study trip
8th week: 1st drawing week / 1st test	
9th week: Lecture: Structure and building techniques of concrete bridges. Concrete beam, frame and arch bridges.	10th week: Lecture: Prestressing techniques. Precast pretensioned girder bridges. Concrete box girders.
11th week: Lecture: Structures and building techniques of cable-stayed bridges. Composite and timber bridges.	12th week: Lecture: Test loading, monitoring and maintenance and strengthening techniques.
13th week: Lecture: Reservoirs, bunkers water-towers.	14th week: Study trip
15th week: 2nd drawing week / 2nd test	

Requirements

Attendance at **lectures** is **compulsory**. Students must attend the lectures and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a lecture with another group. Attendance at lectures will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed lectures should be made up for at a later date, to be discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures to

each lecture. Active participation is evaluated by the teacher in every class. Students' active participation is required.

A, for a signature:

Students have to **submit all the two tests** as scheduled minimum at a sufficient level. During the semester there are two tests – the 1st test in the 8th week and the 2nd test in the 15th week. In order to gain the **signature**, minimum point of tests has to be taken (min. 40 points from 60 points).

B, for a grade:

In order to take an **exam grade** – minimum (2) pass grade – minimum point of tests (min. 40 points from 60 points) and exam points (min. 21 points from 40 points) has to be taken (Summa minimum 61 points from 100 points). The minimum and the maximum points related to the tests and design tasks can be obtained are the follows:

Two tests:				
1. Test:	Maximum:	**30 points**	Minimum:	**20 points**
2. Test:	Maximum:	**30 points**	Minimum:	**20 points**
	Summa:	**60 points**		**40 points**
Points required for signature:				
	Maximum:	**60 points**	Minimum:	**40 points**
Exam:				
	Maximum:	**40 points**	Minimum:	**21 points**
Summa points:				
	Maximum:	**100 points**	Minimum:	**61 points**

The course ends with an **exam grade**. Based on the summa points of the tests and the summa point of the exam, the exam grade is defined according to the following calculation:

Score	Grade
0-60 = fail; 61-70 = pass (2); 71-80 = satisfactory (3); 81-90 = good (4); 91-100 = excellent (5).	

Building Construction

Code: MK3MAG3S8SS17-EN

ECTS Credit Points: 8 credits

Evaluation: mid-semester grade

Year, Semester: 3rd year, 5th semester

Its prerequisite(s): Introduction to Building Construction

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 2+4

Topics:

Load bearing structures (walls, frames, floors, stairs and foundation). Wall-type buildings. Load bearing and space-limiting walls. Lintel, ring-beam. Homogeneous and mixed walls. Systems of construction and building (panels and cast wall construction, frames of reinforced concrete, steel and wood, dry-tech construction, ready-made building). Monolithic RC walls. Partitions. Horizontal load-bearing structures. Dense-rib, floor block, hollow ceramic block, self-formworking floors. Comparative evaluation of alternatives. Design principles and rules of floor systems. Balconies. Structures and roofing of pitched roof, built-in roof space. Structural variants of wooden roof trusses. Transitional and engineered roof trusses. Steel and RC pitched roof structures. Roof cladding. Soft sheet and plate covers. Metal structures of roof covers. Variants of sheetmetal covers. Energy balance of buildings: components, geometric ratio and groundplan arrangement of buildings, natural ventilation, energetic requirements, specific heat demand, procedure of energetic design and checking.

External - independent and built-together - stairs. Structural alternatives of internal stairs. Stone steps. Prefabricated RC, steel and wooden stairs. Accessories of stairs. Foundation and subsoil insulation. Building constructional considerations in selecting foundation mode. Subs, protecting and supporting structures for insulations. Insulating variants for different effects and requirements (coating, felt, expanding and mass insulations). Flat roofs. Main functional and additional layers. Sub, protection against wind suction. Draining vapour pressure. Plastic and coating-like waterproofings. Utilized flat roofs. Roof terraces with conventional and elastically bedded finishes. Variants of green roofs, functional layers. Waterproofing against functional waters.

In seminar there are six tasks to elaborate: 3 homework drawings and 3 workshop drawings.

Literature:

Compulsory:

- AMBROSE, James E.: Building structures, ISBN 0471540609 Wiley, New York 1993.
- BÖHÖNYEY, J.: Building construction encyclopaedia. Iparterv, Budapest 1986.

Schedule

1st week Registration week	
2nd week: **Lecture:** Wall-type buildings **Practice:** issuing the task 1 (homework drawing). Elaborating the workshop drawing 1.	**3rd week:** **Lecture:** Horizontal load-bearing structures **Practice:** consultation of task 1 (homework drawing)
4th week: **Lecture:** Pitched roof **Practice:** consultation of task 1 (homework drawing)	**5th week:** **Lecture:** Roof cladding **Practice:** consultation of task 1 (homework drawing)
6th week: **Lecture:** Passive houses **Practice:** submitting the task 1 (homework drawing). Elaborating the workshop drawing 2.	**7th week:** **Lecture: Mid-term test** **Practice**: Issuing the task 2 (homework drawing). Elaborating the workshop drawing 3.
8th week: 1st drawing week	
9th week: **Lecture:** Stairs **Practice:** consultation of task 2 (homework drawing)	**10th week:** **Lecture:** Foundation and subsoil insulation **Practice**: consultation of task 2 (homework drawing)
11th week: **Lecture:** Flat roofs **Practice:** submitting the task 2 (homework drawing). Issuing task 3 (homework drawing).	**12th week:** **Lecture:** Waterproofing against functional waters. **Practice:** consultation of task 3 (homework drawing)
13th week: **Lecture:** Building visit **Practice:** consultation of task 3 (homework drawing)	**14th week:** **End-term test** Submitting task 3 (homework drawing).
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory.

Participation at practice is compulsory. Students must attend practice classes and may not miss more than three practice classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a

practice with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice class. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

Students have to submit all the six drawing tasks as scheduled minimum at a sufficient level.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. Students have to sit for the tests.

B, for a grade:

The course ends in a mid-semester grade. Based on the average of the marks of the drawings and the average of the test results, the mid-semester grade is calculated as an average of them:

- average grade of the six drawing tasks
- average grade of the two tests

The minimum requirement for the mid-term and end-term tests is 60%. Based on the score of the tests separately, the grade for the tests is given according to the following (score/grade): 0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5).

If the score of any test is below 60, the student once can take a retake test covering the whole semester material.

Building Design

Code: MK3MAG4S6SS17-EN

ECTS Credit Points: 6 credits

Evaluation: mid-semester grade

Year, Semester: 3rd year, 6th semester

Its prerequisite(s): Building Construction

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 2+4

Topics:

This course presents the functional rules of residential building design such as dimensions of rooms, fixtures and furniture with their space limitations. Descriptions from OTÉK, requirements from local development plans, specifications and calculation about forming facade. Significance of orientation. House featuring schema – detached, semi-detached, row houses, atriums. One and multi-storey residential buildings. Arrangements, ground plan systems and functional rules for design of staircases. Shaping the mass, adaptions to the

environment. Space requirements for parking, garbage storage, common areas and elevators in multi-unit residential buildings.

This course presents the design methodology of industrial and agricultural buildings. Functional rules of industrial and agricultural buildings by OTÉK, limitations about peripheral built-in areas, local development plans, main elements, structures. Specific technology requirements described by animal species. Health and environmental rules. Manure management. Structures and types of storage buildings and plant productions. Industrial parks and their regulations, standards. Logistics and service facility needs. Structures of industrial buildings, particularly in light weight structures. Design of social and service spaces, lockers and wet rooms.

Fire protections: Basic rules, structures and classification of buildings based on OTSZ.

Literature:

Compulsory:

- Malcolm Millais: Building structures
- Philip Garrison: Basic Structures for Engineers and Architects
- Ernst Neufert: Arhitects' data
- Jürgen Adam, Kathariana Hausmann, Frank Jüttern: Industrial Buildings

Schedule

1st week Registration week	
2nd week: **Lecture:** Introduction, installation, site concept, content description of the master plan Development of housing premises, their link to each other, function diagram **Practice:** First homework - 25 pieces of furniture, fixtures copying in scale 1:50 M	3rd week: **Lecture:** Description of housing types, freestanding, semi-detached -terraced house, house chain, atrium - in terms of integration Description of floor plan in residential buildings – function diagrams-detached, the boundary, semi-detached **Practice:** Consultation.
4th week: **Lecture:** Description of floor plan in residential buildings – function diagrams-detached, the boundary, semi-detached Two-storey houses plan system, positioning stage, front height - Interpretation of building height. **Practice:** Consultation.	5th week: **Lecture:** Multi-unit residential building types, corridor-related systems Ground floor plans, function diagrams Corridor-related systems, ground floor plans. **Practice:** Consultation.
6th week:	7th week:

Lecture: Multi-residential building design, and it's problems, parking spaces, common areas, elevator. Multi-residential building ground floor plan focus on the structure design. **Practice:** Second homework: 5 various built-storied house plan	**Lecture: Mid-term test** **Practice**: Consultation.
8th week: 1st drawing week	
9th week: **Lecture:** Preparation, application for the courses, description of subject requirements, course schedule and literature lists, registration week History of Hungarian agricultural architecture, government regulations, the provisions of relevant OTÉK Opportunities for farm-site construction **Practice:** Consultation.	**10th week:** **Lecture:** Presentation of livestock farms and prescriptions, animal health considerations and manure management Horse farming, stables, farming buildings, sheep farming **Practice**: Consultation.
11th week: **Lecture:** Cattle, pig farming buildings Storage Buildings in agriculture Wine processing, wineries, Farm Buildings **Practice:** Research- description of 3 processed agricultural structure- scheme, definition of static model and enveloping options	**12th week:** **Lecture:** Fire protection, basic concepts, classification of buildings, structures hall, fire distances, fire load Industrial parks and its benefits Dressing room classification **Practice:** Design of dressing rooms
13th week: **Lecture:** History of reinforced concrete, reinforced concrete long-span structures, the benefits of prefabrication Steel structures, hall structures Industrial coatings, classical and light enveloping, wall and roof structures Details of structures, industrial gates. **Practice:** Consultation.	**14th week:** **End-term test**
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory.

Participation at practice is compulsory. Students must attend the practices and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

Students have to submit all the 3 drawing tasks as scheduled minimum at a sufficient level.

During the semester there are two tests: the mid-term test is in the 7th week and the end-term test in the 14th week. Students have to sit for the tests.

B, for a grade:

The course ends in mid-semester grade. Based on the average of the marks of the drawings and the average of the test results, the mid-semester grade is calculated as an average of them:

- average grade of the 3 drawing tasks
- average grade of the two tests

The minimum requirement for the mid-term and end-term tests is 60%.

Based on the score of the tests separately, the grade for the tests is given according to the following (score/grade): 0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5).

If the score of any test is below 60, the student once can take a retake test covering the whole semester material.

Steel Structures for Buildings

Code: MK3TAR5S6SS17-EN

ECTS Credit Points: 6 credits

Evaluation: exam

Year, Semester: 3rd year, 6th semester

Its prerequisite(s): Steel structures

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Design of trusses. Design of frames. Design of bracing systems. Moment resistance of beam-to-column joints. Stiffness of beam-to-column joints. Moment resistance and stiffness of base

connections. Second order effects on frame structures. Fire design. Design of second order structural elements. Composite structures. Design of special steel structures.

Literature:

Compulsory:

- EN 1993-1-1: 2009 Design of steel structures Part 1-1: General rules and rules for buildings
- EN 1993-1-8: 2005 Design of steel structures Part 1-8: Design of joints
- EN 1993-1-2: 2005 Design of steel structures – Part 1-2: General rules- Structural fire design

Recommended:

- Claudio Bernuzzi, Benedetto Cordova, Structural Steel Design to Eurocode 3 and AISC Specifications, Wiley Blackwell, 2016, ISBN 978-1-118-63128-7
- Jean-Pierre Jaspart, Klaus Weynand, Design of joints in Steel and Compoite Structures, Ernst&Sohn, 2016, ISBN 978-3-433-02985-5

Schedule

1st week Registration week	
2nd week: Lecture: Trusses. Design rules for trusses. Trusses used in frame structures. Bracing system for trusses. Buckling lengths in trusses. Resistance of the rods of the truss. Practice: Introduction of the truss design task.	3rd week: Lecture: Welded connections of chord and braces. Failure modes. Gap-, and overlap type connections, T connections. Practice: Connections in truss.
4th week: Lecture: Design of welded connections under complex loading. Practice: Design of welded connection between chord and braces. Design of welded connection between column and base plate.	5th week: Lecture: Beam-to-column connections. Component method. Failure modes of the "T" element. Column flange under bending. Bolt failure. End plate under bending. Practice: Beam-to-column connection design.
6th week: Lecture: Component method. Column web under tension. Column web under compression. Column web under shear. Beam web under tension. Beam flange under compression. Defining the moment resistance. Stiffness of the connection.	7th week: Lecture: Design of base joint with the component method. Defining the moment resistance and the stiffness. Practice: Base joint design.

Practice: Beam-to-column connection design.	
8th week: 1st drawing week: Deadline for truss design task	
9th week: **Lecture:** Frames. Structural elements with variable cross-sections in frames. Cross-sections under complex loading. Structural elements under complex loading. Defining buckling lengths and support stiffness for stability checks. **Practice:** Introduction of the frame design task.	**10th week:** **Lecture:** Second order effects. Imperfections. The effect of the stiffness of the connections on the moment distribution. Design of the bracing system. **Practice:** Second order effects on a frame.
11th week: **Lecture:** Fire design of Steel Structures. Design of class4 structural elements. Design of second order structural elements. **Practice:** Frame under fire. Second order structural elements.	**12th week:** **Lecture:** Composite structures. Design of composite beam and column. **Practice:** Design of composite beam and column.
13th week: **Lecture:** Design of special steel structures **Practice:** Test. Consultation.	**14th week:** **Lecture:** Study tour - Implementation of a steel structure **Practice:** Study tour - Implementation of a steel structure
15th week: 2nd drawing week: Deadline for frame design task	

Requirements

Participation at **lectures and practice classes** is **compulsory**. Students must attend lectures and practices may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. The attendance will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring calculator and the printed materials of the lectures with them to each lecture and practice. Active participation is evaluated by the teacher in every class. Students active' participation is required.

Students have to **submit the test and the design tasks** as scheduled minimum at a sufficient level.

A, for a signature:

A student has to reach at least 25 points from the 50 points on the test.

A student has to get at least 10 points from the 20 points on the truss design task.

Frame calculation has to be handed in.

B, for a grade:

The course ends with exam grade. The exam consists of a test and an oral part about the frame design task.

A student has to get at least 5 points from the 10 points on the test part of the exam.

A student has to get at least 10 points from the 20 points on the truss design task.

Based on the summa points of tests and design tasks, the exam grade is defined in the following way:

Test:	Maximum:	**50 points**	Minimum:	**25 points**
Homework tasks:				
Homework 1:	Maximum:	**20 points**	Minimum:	**10 points**
Homework 2:	Maximum:	**20 points**	Minimum:	**10 points**
Exam test:	Maximum:	**10 points**	Minimum:	**5 points**
Summa points:	Maximum:	**100 points**		**61 points**

(score/grade): 0-60 = fail; 61-70 = pass (2); 71-80 = satisfactory (3); 81-90 = good (4); 91-100 = excellent (5).

Reinforced Concrete Structures for Buildings

Code: MK3TAR7S6SS17-EN

ECTS Credit Points: 6 credits

Evaluation: exam grade

Year, Semester: 4th year, 7th semester

Its prerequisite(s): Reinforced Concrete Structures

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Theory of elastic slab. Loads and stresses of elastic slab. Differential equitation of the elastic slab. One- and two-way slabs. Approximate solutions for slabs, Marcus type solutions, FEM methods. Design and reinforcement detail of one-way and two-way slabs, the use of individual steel bars and welded steel meshes. Classification of flat slabs (column-head slabs, flat slabs). Design approaches for flat slabs. Reinforcement layout of flat slabs. Shear in flat slabs. Punching shear of flat slabs. Design of punching shear reinforcement, detail of punching shear reinforcement. Plastic analysis of reinforced concrete struts. Static and kinematic methods for determining the plastic capacity of RC structures. Plastic hinge. Plastic analysis of reinforced concrete slabs. Yield line theory. Application of static and kinematic methods for RC slabs.

Types, loads, classification and design considerations for RC columns. Braced and unbraced columns. Eccentricities, imperfections, second order effects. Design possibilities of RC columns. Loads and stresses of RC frames. Approximate determination of frame loads for vertical and horizontal loads. Beam and disturb zones and joints of RC frames, Analysis of different type of frame corners, corbels, half-end beams. Reinforced concrete walls. Loads and design of reinforced concrete walls. Determination of loads and stresses of the bracing systems of high rise reinforced concrete buildings. Special problem of the under reinforced structures subjected normal force. Elastic analysis of reinforced concrete deep beams and shear walls. Plastic analysis of reinforced concrete walls, shear walls and deep beams by strut-and-tile models. Design of reinforced concrete foundations. Types, properties, applications and design aspects of different kind of fibre reinforced concrete. Fire resistance of reinforced concrete structures, design for fire.

Literature:

Compulsory:

- EN 1990:2002/A1:2005 Eurocode - Basis of structural design.
- EN 1991-1-1:2002 Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings.
- MSZ EN 1992-1-1: 2010 Design of concrete structures Part 1-1: General rules and rules for buildings
- MSZ EN 1992-1-2: 2010 Design of concrete structures Part 1-2: General rules. Structural fire design
- MSZ 4798-1:2004 Concrete Part 1: Specification, performance production, conformity, and rules of application of MSZ EN 206-1 in Hungary
- Robert Park & Thomas Paulay: Reinforced Concrete Structures, Wiley-India Edition (2010), ISBN: 978-81-265-2362-5
- Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design Theory and Examples, Taylor & Francis Group (2010), ISBN: 0-415-30796-1
- Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design to Euroceodes – Design Theory and Examples, Taylor & Francis Group (2014), ISBN-13: 978-1-4665-5252-4
- Jack C. McCormac: Design of Reinforced Concrete Fifth Edition, John Wiley &Sons Inc. (2001), ISBN: 0-471-39576-5

Recommended:

- fib Bulletin 51 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 1., Federation International du Béton – International Federation for Structural Concrete, (2009) ISSN: 1562-3610, ISBN:978-2-88394.091-8
- fib Bulletin 52 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 2., Federation International du Béton – International Federation for Structural Concrete, (2010) ISSN: 1562-3610, ISBN:978-2-88394.091-8

- fib Bulletin 53 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 3., Federation International du Béton – International Federation for Structural Concrete, (2009) ISSN: 1562-3610, ISBN:978-2-88394-093-8
- fib Bulletin 54 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 4., Federation International du Béton – International Federation for Structural Concrete (2010), ISSN: 1562-3610, ISBN:978-2-88394-094-9
- fib Bulletin 62 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 5., Federation International du Béton – International Federation for Structural Concrete, (2012) ISSN: 1562-3610, ISBN:978-2-88394-102-1
- A. M. Neville: Properties of concrete Fourth and Final Edition Standarts updated to 2002, Pearson Prentice Hall (2004), ISBN: 0-582-23070-

Schedule

1st week Registration week	
2nd week: Lecture / Practice: Theory of elastic slab. Loads and stresses of elastic slab. Differential equitation of the elastic slab. One- and two-way slabs.	3rd week: Lecture / Practice: Approximate solutions for slabs, Marcus type solutions, FEM methods.
4th week: Lecture / Practice: Design and reinforcement detail of one-way and two-way slabs, the use of individual steel bars and welded steel meshes.	5th week: Lecture / Practice: Classification of flat slabs (column-head slabs, flat slabs). Design approaches for flat slabs. Reinforcement layout of flat slabs. Shear in flat slabs. Punching shear of flat slabs. Design of punching shear reinforcement, detail of punching shear reinforcement.
6th week: Lecture / Practice: Plastic analysis of reinforced concrete struts. Static and kinematic methods for determining the plastic capacity of RC structures. Plastic hinge. Plastic analysis of reinforced concrete slabs. Yield line theory. Application of static and kinematic methods for RC slabs.	7th week: Study trip
8th week: 1st drawing week / 1st test	
9th week: Lecture / Practice: Types, loads, classification and design considerations for RC columns. Braced and unbraced columns.	10th week: Lecture / Practice: Loads and stresses of RC frames. Approximate determination of frame loads for vertical and horizontal loads. Beam and disturb zones and joints of

Eccentricities, imperfections, second order effects. Design possibilities of RC columns.	RC frames, Analysis of different type of frame corners, corbels, half-end beams.
11th week:	**12th week:**
Lecture / Practice: Reinforced concrete walls. Loads and design of reinforced concrete walls. Determination of loads and stresses of the bracing systems of high rise reinforced concrete buildings. Special problem of the under reinforced structures subjected normal force.	**Lecture / Practice:** Elastic analysis of reinforced concrete deep beams and shear walls. Plastic analysis of reinforced concrete walls, shear walls and deep beams by strut-and-tile models.
13th week:	**14th week:**
Lecture / Practice: Design of reinforced concrete foundations. Types, properties, applications and design aspects of different kind of fibre reinforced concrete. Fire resistance of reinforced concrete structures, design for fire.	Study trip
15th week: 2nd drawing week / 2nd test	

Requirements

Attendance at **lectures and practices** is **compulsory**. Students must attend lectures and practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice class with another group. Attendance at lectures and practice will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring the calculator and the printed materials of the lectures with them to each lecture and practice. Active participation is evaluated by the teacher in every class. Active student's participation should be required.

A, for a signature:

In order to take **signature,** students have to **submit all the two tests and the six homeworks** as scheduled minimum at a sufficient level. During the semester there are two tests – the 1st test in the 8th week and the 2nd test in the 15th week – and there are six homework tasks. In order to take the **signature**, minimum point of tests (min. 18 points from 30 points) and homework tasks min. 32 points from 50 points) has to be taken (min. 50 points from 80 points).

B, for a grade:

In order to take an **exam grade** – minimum (2) pass grade – minimum point of tests (min. 18 points from 30 points), minimum points of homework (min. 32 points from 50 points) and minimum points of exam points (min. 11 points from 20 points) has to be taken (Summa minimum 61 points from 100 points). The minimum and the maximum points related to the tests and design tasks can be obtained are the follows:

Two tests:

1. Test: Maximum: **15 points** Minimum: **9 points**

2. Test:	Maximum:	15 points	Minimum:	9 points
	Summa:	30 points		18 points
Six homeworks:				
1. Homework:	Maximum:	8 points	Minimum:	5 points
2. Homework:	Maximum:	8 points	Minimum:	5 points
3. Homework:	Maximum:	8 points	Minimum:	5 points
4. Homework:	Maximum:	8 points	Minimum:	5 points
5. Homework:	Maximum:	8 points	Minimum:	5 points
6. Homework:	Maximum:	10 points	Minimum:	7 points
	Summa:	50 points		32 points
Points required for signature:				
	Maximum:	80 points	Minimum:	50 points
Exam:				
	Maximum:	20 points	Minimum:	11 points
Summa points:				
	Maximum:	100 points	Minimum:	61 points

The course ends with an **exam grade**. Based on the summa points of the tests, the summa points of the homeworks and the summa point of the exam, the exam grade is defined according to the following calculation:

Score		Grade	
0 – 60	points:	fail	(no signature)
61 – 70	points:	pass	(2)
71 – 80	points:	satisfactory	(3)
81 – 90	points:	good	(4)
91 – 100	points:	excellent	(5)

Timber & Masonry Structures

Code: MK3TAR8S4SB17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 4th year, 1st semester

Its prerequisite(s): Construction Materials, Theory of Design & Approximate Calculations

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+0

Topics:

The subject consists of two main parts.

Topics of the Timber part

The structure of wood (macro- and microscopic properties). Wood preservations (fungies, insects, moisture, storage). Roof constructions and ceiling structures (traditional and modern structures). Timber design with EC 5 (basics - compressing, tension, bending). Timber connections (traditional- and designed connections with EC 5).

Topics of the Masonry part

Since the majority of the major masonry structures in Europe are historic structures, in the masonry part of the subject we discuss them with the following main topics:

Evolution of the masonry structural components. History of the structural engineering. Structural engineering of masonry architecture. Materials of masonry structures: stone, brick. Case studies.

As a practice, every student has to hold a 15-minute presentation about a significant masonry building of her/his homeland, and we discuss it with the other students. The main aspects of the presentations: introduction of the building (with map, photos and drawings), the history of the building with special emphasis on its construction, the structural components of the building and their structural behaviour, the building material used and its general characteristic, the general state of the load-bearing masonry structures of the building with special emphasis on the possible failures, suggestion to fix the failures (if there are any), bibliography (including internet sources).

Literature:

Compulsory:

- Jacques Heyman, The Stone Skeleton. Structural Engineering of Masonry Architecture, Cambridge University Press, 1997, ISBN 978-0-521-62963-8
- Nikolaus Pevsner, An Outline of European Architecture, J. Murray, 1948
- Forest Products Laboratory. 2010. Wood handbook—Wood as an engineering material. General Technical Report FPL-GTR-190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 508 p.
- Jack Porteous and Abdy Kerimani, Structural Timber design. Blackwell Science Ltd, 2007, ISBN 978-14051-4638-8
- EN 1995-1-1: Eurocode 5: Design of timber structures- Part 1-1: General- Common rules and rules for buildings

Recommended:

- Wieland Ramm, Design of Masonry Structures According Eurocode 6, Online Resource
- Santiago Huerta, Wedges and plate-bandes: mechanical theories after De la Hire, presses polytechniques et universitaires romandes, 2012, ISBN 978-2-88074-893-7
- Jim Coulson, Wood in Construction. John Wiley & Sons 2012, ISBN13 978-0-47065-777-5
- Hoadley, r. Bruce; Understanding Wood - A craftsman's Guide to Wood Technology, Taunt Press 2000, ISBN13 978-1-561-58358-4

Schedule

1st week Registration week	
2nd week: **Lecture:** History and evolution of the masonry structures, part 1. Case study: the reconstruction of the masonry vault of the Avas church, Miskolc	3rd week: **Lecture:** History and evolution of the masonry structures, part 2. Case study: the structural analysis of the (demolished) medieval system of St. Elisabeth's church in Kassa
4th week: **Lecture:** Evolution of the engineering, the classical theory of the masonry arch Case studies: the operation of the Wiener Bauhütte, the reconstruction of the towers of the Wiesenkirche, Soest	5th week: **Lecture:** Masonry walls and domes Student presentations
6th week: **Lecture:** The masonry vault Student presentations	7th week: **Lecture:** Materials: brick and stone **Test**
8th week: 1st drawing week	
9th week: **Lecture:** Macro- and Microscopic structures of the wood	10th week: **Lecture:** Moisture relations and physical properties of wood
11th week: **Lecture:** Wood preservations (fungus, insects, moisture relations, storage)	12th week: **Lecture:** Roof constructions and ceiling structures
13th week: **Lecture:** Timber design with EC 5 (basics - compressing, tension, bending)	14th week: **Lecture:** Timber connections (traditional- and designed connections with EC 5)
15th week: 2nd drawing week	

Requirements

Participation at **lectures** is **compulsory**. Students must attend lectures and may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. The staff of the department will record the attendance at lectures. In case of further absences, a medical certificate needs to be presented.

For a signature and a grade: every student has to fulfil the minimal requirements both in the Timber and the Masonry part.

The requirements of the **Masonry part** are the following:

For a signature: every student has to hold a 15-minute presentation about a significant masonry building of her/his homeland, discussing each of the following aspects: introduction of the building (with map, photos and drawings), the history of the building with special emphasis on its construction, the structural components of the building and their structural behaviour, the building material used and its general characteristic, the general state of the load-bearing masonry structures of the building with special emphasis on the possible failures, suggestion to fix the failures (if there are any), bibliography (including internet sources)

For a grade: every student has to submit a successful test. The test consists of two parts: the first part is a construction of a thrust line of a masonry arch and some related questions; the second part contains theoretical questions. For a minimum (2) pass grade at least the thrust line construction must be fulfilled. For a maximum (5) grade every related question and every theoretical question has to be answered.

The requirements of the **Timber part** are the following.

For a signature: every student has to do a task until the end of the semester. This task includes some drawing, calculation parts. At the end they will get points on every parts of the task.

Submitted and accepted semester design task requirement is at least 61 points.

Parts and possible points of the task:

Points	max.
• draw the structural layout	20p
• draw at least 2 sections	20p
• timber volumen calculate	20p
• calculate the loads	20p
• design one timber element	20p
summa:	100p

For a grade: successful test about the Timber part

Possible results of Timber test:

Score		Grade	
0 – 60	points:	fail	(no sign)
61 – 70	points:	pass	(2)
71 – 80	points:	satisfactory	(3)
81 – 90	points:	good	(4)
91 – 100	points:	excellent	(5)

The final grade is the average of the grades of the Timber and the Masonry parts.

FEM Modelling

Code: MK3CAD2S5SB17-EN

ECTS Credit Points: 5

Evaluation: mid-semester grade

Year, Semester: 4th year, 7th semester

Its prerequisite: Theory of Girders, Steel Structures, RC Structures

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Short introduction of a FEM method. Introduction of a FEM program. Modelling of beams with the use of different elements. Modelling of frame structures. Modelling of trusses. Modelling of structural joints. Modelling of concrete slabs. Modelling of concrete pools. Modelling of timber structures.

Literature:

Compulsory:

- HUEBNER K.H., DEWHIRST D.L., SMITH D.E., BYROM T.G.: The finit element method for engineers. ISBN 0 471 37078 9, John Wiley and Sons, Inc 2001.
- Guide of the AXIS-VM13 PROGRAM http://ftp2.myaxisvm.com/downloads.axisvm/manual/axisvm_manual13_en.pdf

Recommended:

- BOJTÁR I., GÁSPÁR Zs.: The finite element method for engineers. Terc, Budapest 2003.
- ZIENKIEVICZ O.C., TAYLOR R.L.: The finite element method I. ISBN 0 7506 6320 0, Butterworth-Heinemann, Oxford, 2000.
- BELYTSSCHKO T., LIU W.K., MORAN B.: Nonlinear finite elements for continua and structures. ISBN 0 471 98774 3, John Wiley, Chichester, 2000.

Schedule

1st week Registration week	
2nd week: **Practice:** The FEM method.	3rd week: **Practice:** Presentation of the features of the applied FEM software (AXIS)
4th week: **Practice:** Modelling simple structures as beam, cantilever.	5th week: **Practice:** Modelling truss girder in plane.
6th week: **Practice:** Modelling steel frame in plane.	7th week: **Practice:** Trip.

8th week: 1st drawing week	
9th week: **Practice:** Modelling steel hall building in 3D	**10th week:** **Practice:** Modelling of complex timber roof structures. 3D
11th week: **Practice:** Modelling of concrete slab, supported with beams and columns	**12th week:** **Practice:** Modelling of structures with dynamic loads
13th week: **Practice:** Special features of the program	**14th week:** **Practice: End-term test**
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice** is compulsory. Students must attend the practices and may not miss more than three practice classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator to each practice class. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

During the semester the students have to make FEM models, and they have to send all of them to the leader of the practice at the end of every lesson. If they are correct the student can get signature.

B, for a grade:

The course ends with a **mid-semester grade**. Based on the points of the tasks and on the **end-term test** which is written in the **14th week**.

The grade is given according to the following table:

%	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

Structural Design Project

Code: MK3TAR9S6SB17-EN

ECTS Credit Points: 6 credits

Evaluation: mid-semester grade

Year, Semester: 4th year, 7th semester

Its prerequisite(s): Building design

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Based on the previous study of the students two complex architectural and structural design project must be worked out during the semester composed of 2×5×4=40 hours working hours at the department. The project tasks are determined personally - individual projects which based on the final results of the Building design course and partially based on the Building construction, Steel structures, Reinforced concrete structures curses - but the work can be done in a small group - team works - by the participation of 4 students representing the 4 main activity fields: architectural, steel structure, reinforced concrete structures and timber or masonry structure design. Results of design projects must be presented at the end of the projects.

Literature:

Compulsory:

- EN 1990:2002/A1:2005 Eurocode - Basis of structural design.
- EN 1991-1-1:2002 Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings.
- MSZ EN 1992-1-1: 2010 Design of concrete structures Part 1-1.:General rules and rules for buildings
- MSZ EN 1992-1-2: 2010 Design of concrete structures Part 1-2: General rules. Structural fire design
- MSZ 4798-1:2004 Concrete Part 1: Specification, performance production, conformity, and rules of application of MSZ EN 206-1 in Hungary
- Robert Park & Thomas Paulay: Reinforced Concrete Structures, Wiley-India Edition (2010), ISBN: 978-81-265-2362-5
- Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design Theory and Examples, Taylor & Francis Group (2010), ISBN: 0-415-30796-1
- Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design to Euroceodes – Design Theory and Examples, Taylor & Francis Group (2014), ISBN-13: 978-1-4665-5252-4
- Jack C. McCormac: Design of Reinforced Concrete Fifth Edition, John Wiley &Sons Inc. (2001), ISBN: 0-471-39576-5

- (2001), ISBN: 0-471-39576-5
- EN 1993-1-1: 2009 Design of steel structures Part 1-1: General rules and rules for buildings
- EN 1993-1-8: 2005 Design of steel structures Part 1-8: Design of joints
- EN 1993-1-2: 2005 Design of steel structures – Part 1-2: General rules- Structural fire design
- Forest Products Laboratory. 2010. Wood handbook—Wood as an engineering material. General Technical Report FPL-GTR-190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 508 p.
- Jack Porteous and Abdy Kerimani, Structural Timber design. Blackwell Science Ltd, 2007, ISBN 978-14051-4638-8
- EN 1995-1-1: Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings

Recommended:

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- fib Bulletin 53 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 3., Federation International du Béton – International Federation for Structural Concrete, (2009) ISSN: 1562-3610, ISBN:978-2-88394-093-8
- fib Bulletin 54 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 4., Federation International du Béton – International Federation for Structural Concrete (2010), ISSN: 1562-3610, ISBN:978-2-88394-094-9
- fib Bulletin 62 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 5., Federation International du Béton – International Federation for Structural Concrete, (2012) ISSN: 1562-3610, ISBN:978-2-88394-102-1
- A. M. Neville: Properties of concrete Fourth and Final Edition Standarts updated to 2002, Pearson Prentice Hall (2004), ISBN: 0-582-23070
- Claudio Bernuzzi, Benedetto Cordova, Structural Steel Design to Eurocode 3 and AISC Specifications, Wiley Blackwell, 2016, ISBN 978-1-118-63128-7
- Jean-Pierre Jaspart, Klaus Weynand, Design of joints in Steel and Compoite Structures, Ernst&Sohn, 2016, ISBN 978-3-433-02985-5
- Hoadley, r. Bruce; Understanding Wood - A craftsman's Guide to Wood Technology, Taunt Press 2000, ISBN13 978-1-561-58358-4

Schedule

1st week Registration week	
2nd week: Lecture: Definition of the 1st design project. Architectural appearances. Structural geometry, function, effects and loads. Preliminary calculations.	3rd week: Lecture: Design of structural steel members and connections, materials, corrosion and fire protection. Detailing.
4th week: Lecture: Design of timber members and connectors, definition of materials, corrosion and fire protection of members. Detailing.	5th week: Lecture: Design of reinforced concrete members and reinforcement, definition of materials, corrosion and fire protection of members. Detailing.
6th week: Lecture: Presentation of 1st projects.	7th week: Study trip
8th week: 1st drawing week	
9th week: Lecture: Definition of the 2nd design project. Architectural appearances. Structural geometry, function, effects and loads. Preliminary calculations.	10th week: Lecture: Design of timber members and connectors, definition of materials, corrosion and fire protection of members. Detailing.
11th week: Lecture: Design of structural steel members and connections, materials, corrosion and fire protection. Detailing.	12th week: Lecture: Design of reinforced concrete members and reinforcement, definition of materials, corrosion and fire protection of members. Detailing.
13th week: Lecture: Presentation of 2nd projects.	14th week: Study trip
15th week: 2nd drawing week	

Requirements

Participation at **practice classes** is **compulsory**. Students must attend **practice** and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at practice classes will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring the calculator and the printed materials of the lectures with them to each practices. Active participation is evaluated by the teacher in every class. Active student's participation should be required.

Students have to **submit all the two design tasks** as scheduled minimum at a sufficient level. In order to take a **mid-semester grade** – minimum (2) pass grade, – minimum point of design task

and presentation has to be taken (Summa minimum 61 points from 100 points). In order to take a mid-semester grade – minimum (2) pass grade – minimum point of design tasks has to be taken. The minimum and the maximum points related to the design tasks can be obtained are the follows:

Design projects:				
1. Design project:	Maximum:	**30 points**	Minimum:	**19 points**
2. Presentation of the 1st project:				
	Maximum:	**10 points**	Minimum:	**6 points**
3. Design project:	Maximum:	**50 points**	Minimum:	**30 points**
4. Presentation of the 2nd project:				
	Maximum:	**10 points**	Minimum:	**6 points**
Summa points:	Maximum:	**100 points**	**61 points**	

The course ends with a **mid-semester grade**. Based on the summa points of the design projects, the mid-semester grade is defined according to the following calculation:

0 – 60 points: fail (no sign); 61 – 70 points: pass (2); 71 – 80 points: satisfactory (3); 81 – 90 points: good (4); 91-100 points: excellent (5)

DIPLOMA

Within 30 days of the successful final exam the diploma is issued and given out by the Faculty at the graduate's special request. Otherwise, the diploma will be awarded to him/her at the graduation ceremony of the Faculty.

The diploma is an official document decorated with the coat of arms of Hungary which verifies the successful completion of studies in the Civil Engineering undergraduate program. It contains the following data: name of HEI (higher education institution); institutional identification number; serial number of diploma; name of diploma holder; date and place of his/her birth; level of qualification; training program; specialization; mode of attendance; place, day, month and year issued. Furthermore, it has to contain the dean's (or vice-dean's) original signature and the seal of HEI. The University keeps a record of the diplomas issued.

At the graduate's special request, a certificate on the completion of studies is issued. The document does not contain any reference to qualification, it merely proves that the candidate has taken a successful final exam. The Faculty keeps a record of the certificates issued.

Calculating diploma grade
Grade=(A+B+C+D)/4, where

A: Weighted grade point average

B: Average of comprehensive exams

C: Average of the grades of the thesis (evaluation of the supervisor and the referee)

D: Grade for final exam presentation

Classification of the award on the bases of the calculated average:

Outstanding	4,81 – 5,00
Excellent	4,51 – 4,80
Good	3,51 – 4,50
Satisfactory	2,51 – 3,50
Pass	2,00 – 2,50

Diploma with Honours

An award with Distinction is permitted where a student obtained grade 5 in all subjects of the final exam. The average of thesis grade, his/her exam grades and mid-semester grades during his/her studies is at least 4.

MODEL CURRICULUM OF CIVIL ENGINEERING BSC - STRUCTURAL ENGINEERING SPECIALIZATION

The curriculum of the program is available in excel format on the webpage of the Faculty of Engineering (https://eng.unideb.hu/en/node/195).

Nr.	Group	Name of Subject	Kno.	Subject Code	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester	Pre requisites:
1	Basics of Natural Sciences **Σ: 54 credits**	Mathematics I	0 0	MK3MAT1A08SX17-EN	4 4 e 8								
2		Mathematics II	0 0	MK3MAT2A06SX17-EN		2 4 e 6							Mathematics I
3		Descriptive Geometry	0 0	MK3MAT3A04SX17-EN	0 4 m 4								
4		Informatics for Civil Engineers	0 2	MK3INF1A04SX17-EN	0 4 m 4								
5		Civil Engineering Orientation	2 0	MK3MEC1S08SX17-EN	4 2 m 8								
6		Statics	2 0	MK3MEC2S08SX17-EN		0 6 e 8							Civil Engineering Orientation
7		Strength of Materials	2 0	MK3MEC3S08SX17-EN			0 6 e 8						Statics
8		Dynamics	2 0	MK3MEC4S04SX17-EN				0 4 e 4					Civil Engineering Orientation
9		Theory of Girders	2 0	MK3MEC5S04SS17-EN					0 4 m 4				Strength of Materials
10	Economics & Humanities **Σ: 16 credits**	Economics	4 0	MK3GAZ1M04SX17-EN		1 3 e 4							
11		Construction Management	4 1	MK3MUM1M04SX17-EN						0 4 m 4			
12		Management & Business Economics	4 2	MK3MEN1M04SX17-EN								4 0 e 4	
13		State Administration, Low & Estate Registering	4 0	MK3GAZ2M04SX17-EN								4 0 e 4	
14	Civil Engineering Compulsory Subjects **Σ: 92 credits**	Civil Engineering Draw	2 1	MK3MAG1S06SX17-EN	2 2 m 4								
15		Introduction to Building Construction	2 1	MK3MAG2S06SX17-EN		2 2 e 6							Descriptive Geometry, Civil Engineering Draw
16		Civil Engineering CAD I	2 2	MK3CAD1S04SX17-EN			0 4 m 4						Descriptive Geometry, Civil Engineering Draw
17		Geoinformatics I	2 3	MK3GEO1S06SX17-EN		4 2 m 6							Civil Engineering Orientation
18		Geoinformatics II	2 3	MK3GEO2S06SX17-EN			4 2 e 6						Geoinformatics I
19		Hydraulics & Hydrology I	2 4	MK3VIZ1S06SX17-EN				4 2 e 6					Civil Engineering Orientation
20		Introduction to Water Engineering	2 4	MK3VIZ2S06SX17-EN					4 2 e 6				Hydraulics & Hydrology I
21		Construction Materials	2 5	MK3EPA1S06SX17-EN			4 2 e 6						Civil Engineering Orientation
22		Geotechnics I	2 6	MK3GTH1S06SX17-EN				4 2 e 6					Civil Engineering Orientation, Strength of Materials
23		Geotechnics II	2 6	MK3GTH2S06SX17-EN					4 2 e 6				Geotechnics I
24		Geotechnics III	2 6	MK3GTH3S06SX17-EN						4 2 e 6			Geotechnics II
25		Theory of Transportation & Basics in Urban Planing	2 7	MK3KOZ1S06SX17-EN			4 0 m 6						Geoinformatics I
26		Planing & Design of Transport Facilities	2 7	MK3KOZ2S06SX17-EN				4 2 e 6					Theory of Transportation & Basics in Urban Planing
27		Theory of Design & Approximate Calculations	2 8	MK3TAR1S04SX17-EN				4 0 m 4					Strength of Materials
28		Steel Structures	2 8	MK3TAR2S06SX17-EN					4 0 m 5				Construction Materials, Theory of Design & Approximate Calculations
29		Reinforced Concrete Structures	2 8	MK3TAR3S04SX17-EN						4 0 m 5			Construction Materials, Theory of Design & Approximate Calculations
30		Bridges & Civil Engineering Structures	2 8	MK3TAR4S04SX17-EN							4 0 e 4		Steel Structures, RC Structures, Geotechnics III
31	Structural Engineering Specialization **Σ: 56 credits**	Building Construction	2 1	MK3MAG3S08SS17-EN					2 4 m 8				Introduction to Building Construction
32		Building Design	2 1	MK3MAG4S06SS17-EN						2 4 m 6			Building Construction
33		Steel Structures for Buildings	2 8	MK3TAR5S06SS17-EN						4 2 e 6			Steel Structures
34		Reinforced Concrete Structures for Buildings	2 8	MK3TAR7S06SS17-EN							4 2 e 6		Reinforced Concrete Structure
35		Timber & Masonry Structures	2 8	MK3TAR8S04SB17-EN							4 0 m 4		Construction Materials, Theory of Design & Approximate Calculations
36		FEM Modelling	2 2	MK3CAD2S05SB17-EN							0 4 m 5		Theory of Girders, Steel Structures, RC Structures
37		Structural Design Project	2 8	MK3TAR9S06SB17-EN							0 4 m 6		Building Design
38		Structural Engineering Compulsory Exam		MK3KSS1S00SB17-EN								0 0 e 0	
39		Diploma Project		MK3DIP1S15SB17-EN								0 6 m 15	
40	Opt. Subj. **Σ: 12 credits**	Optional Subject I									6		
41		Optional subject II										6	
42	Industrial & Laboratory Practices **Σ: 10 credits**	Geoinformatics Practice	2 2	MK3GEO3S02SX17-EN		2 days m 2							
43		Industrial Practice		MK3TCH1S04SX17-EN				6 weeks m 4					
44		Structural Design Practice	2 8	MK3TAR6S02SB17-EN						2 days m 2			
45		Material & Structural Engineering Laboratory	2 4	MK3EPA2S02SS17-EN						2 days m 2			

1116	Sum of Lecture Hours	**Sum:**	10	16	**26**	28	9	17	**26**	32	12	14	**26**	30	16	10	**26**	30	14	12	**26**	29	14	12	**26**	31	12	10	**22**	31	8	6	**14**	29
1146	Sum of Seminar Hours	Exam:			1				4				3				4				2				2				2				3	
2262	Sum of Contact Hours	Semester Mark:			4				2				2				1				3				5				4				2	
21	Sum of Exam	Sign:			0				0				0				1				0				0				0				0	
23	Sum of Semester Mark																																	
1	Sum of Sign																																	
240	Credits																																	
24	Mean Contact Hours per Week																																	

Abbreviations:
L = Lecture
P = Practice
E = Evaluation
C = Credits
e = exam
m = mid-semester grade
s = signature