

**BULLETIN**

**UNIVERSITY OF DEBRECEN**

**ACADEMIC YEAR 2016/2017**

**Civil Engineering BSc**

**FACULTY OF ENGINEERING**

Coordinating Center for International Education



# Table of Contents

DEAN'S WELCOME.....	1
THE HISTORY OF THE UNIVERSITY AND DEBRECEN.....	2
ADMINISTRATION UNITS.....	3
DEPARTMENTS OF THE FACULTY OF ENGINEERING.....	4
ACADEMIC CALENDAR OF THE FACULTY OF ENGINEERING.....	9
THE ECTS CREDIT POINT SYSTEM.....	11
MODEL CURRICULUM OF CIVIL ENGINEERING BSC TRAINING.....	12
ACADEMIC PROGRAM FOR CIVIL ENGINEERING BSC.....	20
INTERNSHIP.....	124
THESIS.....	126

## **CHAPTER 1 DEAN'S WELCOME**

---

Welcome to the Faculty of Engineering!

This is an exciting time for you, and I encourage you to take advantage of all that Faculty of Engineering UD offers you during your bachelor's or master's studies. I hope that your time here will be both academically productive and personally rewarding. Think creatively and be confident.

The Faculty of Engineering of the University of Debrecen is at the forefront of the education and training of engineers in the North-Great-Plain Region of Hungary. It is a dynamically developing Faculty with over 3000 students and a highly-qualified and enthusiastic teaching staff of about 80 members. We offer a great variety of BSc, MSc courses and post-graduate training courses tailored to suit the rapidly changing world of engineering and focusing on European and international trends.

In order to optimize the quality of training the Faculty continuously strives to expand the number of industry and educational partners at home and abroad.

The Faculty was awarded the Quality Prize in 2011 by the Ministry of Education as recognition of its efforts in this field.

I wish you every success in your studies and hope to meet you personally in the near future.

Best wishes,

Edit Szűcs  
Dean

**CHAPTER 2**  
**THE HISTORY OF THE UNIVERSITY AND DEBRECEN**

---

The history of Debrecen's higher education dates back to the 16<sup>th</sup> 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 the University of Debrecen is classified as a “University of National Excellence” and offers the highest number of academic programs in the country, hence it is one of the best universities in Hungary. Its reputation is a 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, of which about 3700 are international students, the University of Debrecen is one of the largest institutions of higher education in Hungary.

## CHAPTER 3 ADMINISTRATION UNITS

---

Dean:	Ms. Edit Szűcs Dr. habil.
E-mail:	dekan@eng.unideb.hu
Vice-Dean for Educational Affairs:	Géza Husi PhD habil.
E-mail:	husigeza@eng.unideb.hu
Vice-Dean for Scientific Affairs:	Ferenc Kalmár PhD
E-mail:	kalmarf@eng.unideb.hu
Head of Directory Office:	Ms. Noémi Dr. Bíró Siposné
E-mail:	bironoemi@eng.unideb.hu
Address:	4028 Ótemető u. 2-4.
Phone:	+36-52-415-155/77741
Head of Students' Administration Office:	Tibor Balla
Phone number:	+36-52-415-155/77767
Administrator for Foreign Students:	Ms. Ágnes György
Phone number:	+36-415-155/77833
e-mail:	agnes@eng.unideb.hu
Head of English program Office:	Zsolt Tiba PhD habil
International Relationship Coordinator:	Ms. Zita Szilágyi Popovicsné
Address:	4028 Debrecen, Ótemető u. 2-4.
E-mail:	programcoordinator@eng.unideb.hu
International Relationship Coordinator:	Ms. Erika Thomas;
Address:	4028 Debrecen, Ótemető u. 2-4.
E-mail:	thomas.erika@eng.unideb.hu

**CHAPTER 4**  
**DEPARTMENTS OF THE FACULTY OF ENGINEERING**

---

**DEPARTMENT OF ARCHITECTURE**

Ótemető u. 2-4., Debrecen, 4028, Tel: +36 (52) 415-155/ 78704

Web: <http://epitesz.eng.unideb.hu/>

Professor, Head of Department	Antal Puhl DLA
College Professor	Gábor Mátyás Csanády DLA Marcel Ferencz DLA
Associate Professor	Balázs Falvai DLA Péter Kovács M.D., DLA, Ph.D., D.Sc. Tamás Szentirmai DLA Dávid Török DLA
Assistant Lecturer	Béla Bogdándy Miklós János Boros Ferenc Kállay Ms. Anita Kántor Gábor Zombor
Secretary	Ms. Anita Tóth-Szél

**DEPARTMENT OF BASIC TECHNICAL STUDIES**

2-4 Ótemető street, Debrecen, 4028, Tel: +36-52-415-155 / 77730

E-mail: [magdi@eng.unideb.hu](mailto:magdi@eng.unideb.hu), Web: <http://www.eng.unideb.hu/userdir/mat/>

college professor, head of department	Imre Kocsis Ph.D.
College Professor	Gusztáv Áron Sziki Ph.D.
College Associate Professor	Ms. Mária Krauszné Princz Ph.D. Balázs Kulesár Ph.D. Ms. Rita Nagyné Kondor Ph.D.
Assistant Lecturer	Ms. Adrien Árvainé Molnár Ms. Éva Csernusné Ádámkó Csaba Gábor Kézi Ms. Erika Perge Attila Vámosi
Secretary	Ms. Sándorné Anton

**DEPARTMENT OF BUILDING SERVICES AND BUILDING  
ENGINEERING**

Ótemető street 2-4., Debrecen, 4028, Tel: +36-52-415-155 / 77770

Web: <http://www.eng.unideb.hu/userdir/eglt/>

college professor, head of department	Ferenc Kalmár Ph.D.
college associate professor, deputy head of department	Ákos Lakatos Ph.D.
College Associate Professor	Ms. Tünde Klára Kalmár Ph.D.
Assistant Lecturer	Béla Bodó Imre Csáky Sándor Hámori Gábor L. Szabó Ferenc Szodrai Zoltán Verbai
Departmental Engineer	Attila Kerekes
Emeritus	András Zöld Ph.D.
Secretary	Lola Csibi

**DEPARTMENT OF MECHANICAL ENGINEERING**

2-4 Ótemető street , Debrecen, 4028, Tel: +36-52-415-155 / 77776

Web: <http://www.eng.unideb.hu/userdir/gepsz/>

college professor, head of department	Tamás Mankovits Ph.D.
College Professor, Deputy Head of Department	Lajos Dr. Fazekas Ph.D.
College Professor	Zsolt Tiba Dr. habil.
Associate Professor	Ms. Ágnes Battáné Gindert-Kele Dr. Ph.D. György Juhász M.D.
College Associate Professor	Sándor Bodzás Ph.D.
Assistant Lecturer	Gábor Balogh M.Sc. Krisztián Deák József Menyhárt Ph.D. Sándor Pálincás Ph.D.
Departmental Engineer	Zsolt Békési András Gábora Dávid Huri



## DEPARTMENTS OF THE FACULTY OF ENGINEERING

---

Senior Lecturer	Sándor Hajdu
Technical Lecturer	Márton Lévai István Székács
Secretary	Ms. Judit Bak

### **DEPARTMENT OF ENGINEERING MANAGEMENT AND ENTERPRISE**

2-4 Ótemető street , Debrecen, 4028, Tel: +36-52-415-155 / 77762

E-mail: [magdi@eng.unideb.hu](mailto:magdi@eng.unideb.hu), Web: [http://www.eng.unideb.hu/index.php?pageid=muszaki\\_menedzsment\\_es\\_vallalkozasi\\_tanszek](http://www.eng.unideb.hu/index.php?pageid=muszaki_menedzsment_es_vallalkozasi_tanszek)

College Professor, Dean, Head of Department	Ms. Edit Szűcs Dr. habil.
Titular Professor	Tibor Szász Ph.D.
College Professor	Géza Lámer Ph.D.
College Senior Lecturer	Ms. Éva Dr. Bujalosné Kóczán
Associate Professor	István Budai Ph.D. Ms. Judit T. Kiss Ph.D.
Master Lecturer	Ms. Tünde Jenei
Assistant Lecturer	Tibor Balla M.Sc. Ms. Anita Dr. Mikó-Kis Attila Halczman M.Sc.
Departmental Engineer	Ms. Kata Anna Váró
Engineering Lecturer	Róbert Sztányi
Senior Lecturer	Gyula Mikula Ms. Éva Diószeginé Zentay Ms. Andrea Emese Matkó Ph.D.

### **DEPARTMENT OF CIVIL ENGINEERING**

2-4 Ótemető street, Debrecen, 4028, Tel: +36-52-415-155 / 77764

E-mail: [info@eng.unideb.hu](mailto:info@eng.unideb.hu), Web: <http://www.epito.eng.unideb.hu>

college professor, head of department	Imre Kovács Ph.D.
College Professor	György Csomós Ph.D. János Major Ph.D. habil.
Associate Professor	József Garai Ph.D. habil. Ms. Kinga Nehme Ph.D.
College Associate Professor	Sándor Fehérvári Ph.D.

Assistant Lecturer	Ms. Gabriella Hancz Ph.D. Ms. Krisztina Kozmáné Szirtesi Ms. Beáta Pataki Ádám Ungvárai Zsolt Vadai Zsolt Varga László Tamás Vincze
Departmental Engineer	József Kovács Zsolt Martonosi Ms. Beáta Szakács László Tarcsai
Engineering Lecturer	János Bíró
Senior Lecturer	Ms. Herta Czédli Ph.D. László Radnay Ph.D.
Assistant Lecturer Practitioner	János Bíró
Invited Lecturer	Zoltán Bereczki Titusz Igaz Péter Lugosi István Szabó Ph.D., C.Sc.
Secretary	Ms. Mónika Tóthné Csákó

**DEPARTMENT OF ELECTRICAL ENGINEERING AND MECHATRONICS**

2-4 Ótomető street, Debrecen, 4028, Tel: +36-52-415-155 / 77742

Web: <http://eem.eng.unideb.hu/>

Associate Professor, Head of Department	Géza Husi Ph.D. habil.
Associate Professor	Péter Tamás Szemes Ph.D.
College Associate Professor	János Tóth Ph.D.
Master Lecturer	István Ákos Bartha
Assistant Lecturer	Sándor Piros Ph.D. Attila Vitéz
Departmental Engineer	Gyula Attila Darai István Nagy Ph.D.
Secretary	Ms. Nóra Tóth
PhD Student	Ms. Emese Bánóczy-Sarvajcz István Pógár

**DEPARTMENT OF CHEMICAL AND ENVIRONMENTAL ENGINEERING**

2-4 Ótemető street, Debrecen, 4028, Tel: +36-52-415-155 / 77827

E-mail: labodaneandi@eng.unideb.hu, Web: <http://eng.unideb.hu/userdir/kvt/>

college professor, head of department	Ms. Ildikó Bodnár Ph.D.
College Assistant Professor	Sándor Fórián
College Associate Professor	Norbert Boros Ph.D.
	Ms. Andrea Keczánné Üveges Ph.D.
Assistant Lecturer	Dénes Kocsis Ph.D.
Secretary	Ms. Andrea Dr. Labodáné Makay

**COORDINATING CENTER FOR INTERNATIONAL EDUCATION**

Nagyerdei körút 98., Debrecen, 4032, Tel: +36-52-512-900/62796

E-mail: [info@edu.unideb.hu](mailto:info@edu.unideb.hu)

Assistant	Ms. Ibolya Kun
Administrator	Ms. Ágnes Czibere

**English Program Office**

Ótemető u. 2-4., Debrecen, 4028, Tel: +36-52-415-155/78707, 78708

E-mail: [programcoordinator@eng.unideb.hu](mailto:programcoordinator@eng.unideb.hu), Web: <http://www.eng.unideb.hu>

Head of English Program Office	Zsolt Tiba Dr. habil.
International Relationship Coordinator	Ms. Zita Popovicsné Szilágyi
	Ms. Erika Thomas

## CHAPTER 5

### ACADEMIC CALENDAR OF THE FACULTY OF ENGINEERING

It is an informative table. you can see the actual Academic Calendar on our website:  
[www.eng.unideb.hu](http://www.eng.unideb.hu) (in English Program menu).

<b>Faculty calendar of the academic year 2016/2017</b>	
<b>Faculty of Engineering, University of Debrecen</b>	
<b>Opening ceremony of the academic year</b>	11 <sup>th</sup> September 2016.
1 <sup>st</sup> semester registration week	From 12 <sup>th</sup> September till 16 <sup>th</sup> September 2016.
Repeat period of exam courses announced for the 1 <sup>st</sup> semester of the academic year 2016/2017	From 12 <sup>th</sup> September till 16 <sup>th</sup> September 2016.
<b>1st semester study period of BSc program</b>	From 19 <sup>th</sup> September till 23 <sup>rd</sup> December 2016 (14 weeks). In case of finalist courses: from 19 <sup>th</sup> September till 18 <sup>th</sup> November 2016 (10 weeks).
<b>1st semester study period of BSc dual program</b>	From 19 <sup>th</sup> September till 16 <sup>th</sup> December 2016 (13 weeks).
Reporting period (Drawing week) of BSc and BSc dual program	From 31 <sup>st</sup> October till 4 <sup>th</sup> November 2016 (5 working days without scheduled lessons, consultation schedule announced previously).
Reporting period (Drawing week, term for elaborating tasks apart from the finalist courses) of BSc program	From 12 <sup>th</sup> December till 16 <sup>th</sup> December 2016 (5 working days without scheduled lessons, consultation schedule announced previously).
<b>1st semester exam period</b>	From 27 <sup>th</sup> December 2015 till 10 <sup>th</sup> February 2016 (7 weeks). From 21 <sup>st</sup> November till 23 <sup>rd</sup> December 2016 (5 weeks) for graduating students.
Deadline of submitting degree theses and dissertations	According to the decision of the departments but in 21 days in proportion to the first day of the state exam.
State exams (according to the decision of the departments)	At least one occasion in January 2017. The departments shall advertise the date of the state exam until 15 <sup>th</sup> September 2016.
2 <sup>nd</sup> semester registration week	From 13 <sup>th</sup> February till 17 <sup>th</sup> February 2017.
<b>2nd semester study period of BSc program</b>	From 20 <sup>th</sup> February till 26 <sup>th</sup> May 2017 (14 weeks). In case of finalist courses: from 15 <sup>th</sup> February till 29 <sup>th</sup> April 2016 (10 weeks).
<b>2nd semester study period of BSc dual program</b>	From 20 <sup>th</sup> February till 19 <sup>th</sup> May 2017 (13 weeks).
Reporting period (Drawing week) of BSc and BSc dual program	From 27 <sup>th</sup> March till 31 <sup>st</sup> March 2017. (5 working days without scheduled lessons, consultation schedule announced previously)

ACADEMIC CALENDAR OF THE FACULTY OF ENGINEERING

Reporting period (Drawing week, term for elaborating tasks apart from the finalist courses) of BSc program	From 15 <sup>th</sup> May till 19 <sup>th</sup> May 2017 (5 working days without scheduled lessons, consultation schedule announced previously).
<b>2nd semester exam period</b>	From 29 <sup>th</sup> May till 14 <sup>th</sup> July 2017 (7 weeks). From 24 <sup>th</sup> April till 26 <sup>th</sup> May 2017 (5 weeks) for graduating students.
Deadline of submitting degree theses and dissertations	According to the decision of the departments but in 21 days in proportion to the first day of the state exam.
State exams (according to the decision of the departments)	At least one occasion in June 2016. The departments shall advertise the date of the state exam until 15 <sup>th</sup> February 2017.

## CHAPTER 6

### THE ECTS CREDIT POINT SYSTEM

---

The European Credit Transfer System (ECTS) is a system based on allocation and transfer of academic credits. It was developed and tested in a pilot scheme by 145 European institutions of higher education from all Member States and EFTA countries. 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. These are issues of quality which have to be determined by the higher education institutions themselves when establishing a satisfactory basis for co-operation agreements, bilaterally or multilaterally.

The main characteristics of ECTS are:

Credits are allocated to each course unit. The starting point is the normal pattern of courses a student would have to take in an academic year. 60 credits represent the workload of an academic year of study. Each institution produces an information package as a guide to all courses available to ECTS students. The courses are described not only in terms of content but also have credits added to each course. Before the student leaves for the host institution, the home institution, the host institution and the student sign a learning agreement in which the study programme abroad is agreed upon. A transcript of records which gives all details of previous higher education is attached to the learning agreement. The transcript of records lists all successfully completed courses together with details on the course, code, content and credits. The home institution guarantees full academic recognition. The study period abroad replaces a comparable period of study at the home university. In order to promote a universal implementation of ECTS as part of ERASMUS, the European Commission respects the right of each institute of higher education, to choose whatever recognition methods or agreements best suit their particular needs. If, however, student mobility is to provide universal academic recognition, as many universities as possible should give thought to a system of recognition using commonly understood measurements. ECTS has so far proved the best instrument to create transparency. Universities that receive financial support for their ERASMUS programmes should envisage measurements to implement ECTS at their institution - or if it is already in use, to try to progress ECTS implementation within further departments/ faculties.

Hungarian Grading Scale Definition ECTS Grading Scale Percentage of successful students usually achieving this grade

5 - Excellent: Outstanding performance with only minor errors - A - 10

4 - Good: Above the average standard but with some errors -B - 25

3 - Good: Generally sound work with a number of notable errors - C - 30

3 - Satisfactory: Generally sound work with a number of notable errors - D - 25

2 - Sufficient: Performance meets the minimum criteria - E - 10

1 - Fail: Some more work required before the credit can be awarded - F - 0

On the following pages the mandatory courses are listed within the framework of the usual schedule of studies for students of medicine at the University of Debrecen. Here incoming ERASMUS students can find the allotted number of ECTS credit points, as well as a brief description of the course content and the assessment requirements. International students study the English or Hungarian Program of the University of Debrecen. The curriculum parallels that of the Hungarian Engineering Program.

**CHAPTER 7**  
**MODEL CURRICULUM OF CIVIL ENGINEERING BSC**  
**TRAINING**

**Compulsory courses for the 1<sup>st</sup> year**

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Basics of Engineering Calculations	MFTTA31X00-EN		2		ESE	0	None
1	Engineering Physics	MFMFI31G02-EN	2			ESE	2	None
1	European Studies	MFEUI31X02-EN				ESE	0	None
1	Geoinformatics I	MFGIN31S04-EN	2		2	AW5	4	None
1	Informatics for Engineers I	MFINF31X03-EN		2		ESE	3	None
1	International Communities and Organizations	MFICO31X02-EN	2			AW5	2	None
1	Mathematics I	MFMAT31S05-EN	2	3		ESE	5	None
1	Technical Chemistry	MFKEM31X03-EN	2	1		ESE	3	None
1	Technical Drawing I	MFMAB31G03-EN	1	2		AW5	3	None
1	Technical Drawing II	MFMAB31G03-EN	1	2		ESE	3	None
1	Urban & Regional Development	MFTTEL31S03-EN	2			AW5	3	None

### Compulsory courses for the 1<sup>st</sup> year

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	CAD modelling I	MFCAD31S04-EN			4	ESE	4	Descriptive Geometry
2	Construction Materials I	MFEP31S03-EN	2	1		ESE	3	Engineering Physics: MF31S03-EN, Technical Chemistry: MF31S03-EN
2	Geoinformatics II	MFGIN32S04-EN	2		2	ESE	4	Geoinformatics I: MFGIN31S04-EN
2	Hydraulics I	MFHID31S04-EN	2		2	ESE	4	Engineering Physics: MF31S03-EN
2	Informatics for Engineers II	MFINF32X03-EN		2		AW5	3	Informatics for Engineers I MFINF31X03-EN
2	Introduction to Ethics	MFTAI31X02-EN	2			ESE	2	None
2	Mathematics II	MF32S05-EN	2	3	5	ESE	5	Mathematics I MF31S05-EN
2	Mechanics I	MFMEC31S05-EN	2		2	ESE	5	Mathematics I: MF31S05-EN, Engineering Physics: MF31S03-EN



**Compulsory courses for the 2<sup>nd</sup> year**

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Building Construction I	MF MAG31S04-EN	2		2	ESE	4	Technical Drawing II: MF MAB31S03-EN
1	Construction Materials II	MF EPA32S03-EN	2	1		ESE	3	Construction Materials I: MF EPA31S03-EN
1	Economics for Engineers	MF KGZ31X04-EN	3			ESE	4	None
1	Geographical Information System (GIS) I	MF TIN31S03-EN	1		2	AW5	3	Geoinformatics II: MF GIN32S04-EN
1	Geology	MF GEO31S03-EN	2			ESE	3	None
1	Hydrology and hydrogeology I	MF HIO31S04-EN	2	2		ESE	4	None
1	Mathematics Final Exam	MF MAT30X00-EN				FE	0	MF MAT33S03-EN
1	Mathematics III	MF MAT33S03-EN	2	2		ESE	3	Mathematics II MF MAT32S05-EN
1	Mechanics II	MF MEC32S05-EN	2		2	ESE	5	Mechanics I (Statics): MF MEC31S05-EN
1	Theory of Design	MF MEL31S04-EN	2		2	AW5	4	Mechanics I: MF MEC31S05-EN

### Compulsory courses for the 2<sup>nd</sup> year

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Basics of Environmental Engineering	MFKOR31S03-EN	2	1		ESE	3	Hydrology and hydrogeology I: MFHIO31S04-EN, Technical Chemistry: MFKEM31S03-EN
2	Geotechnics I	MFGTH31S04-EN	2	2		ESE	4	Mechanics II MFMEC32S05, Geology: MFGEO31S03-EN
2	Mechanics III	MFMEC33S05-EN	2		2	ESE	5	Mechanic I: MFMEC31S05-EN
2	Microeconomics	MFVGF31X04-EN	1	2		ESE	4	Economics for Engineers MFKGZ31X04-EN
2	Public Works I	MFKOZ31S04-EN	2		2	ESE	4	Hydraulics I: MFHID31S04-EN
2	Reinforced Concrete Structures I	MFVBS31S03-EN	2		1	AW5	3	Construction Materials II.: MFEPA32S03-EN, Theory of Design: MFMEC31S04-EN
2	Steel Structures I	MFACS32S03-EN	2	1		AW5	3	Construction Materials II
2	Transportation Engineering I	MFKLE31S03-EN	2	1		ESE	3	Geoinformatics I MFGTH31S04
2	Transportation Engineering II	MFKLE32S03-EN	2	1		ESE	3	None

**Compulsory courses for the 3<sup>rd</sup> year**

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Basics of Quality Management	MFMIN31X04-EN	1	1		AW5	4	None
1	Building Construction II	MFMAG32SS4-EN	2		2	ESE	4	Building Construction I: MFMAG31S04-EN
1	Construction Management I	MFKIV31S03-EN	1	2		AW5	3	Management for Engineers: MFMEF31X03-EN
1	Design of Buildings I	MFETE31SS3-EN	1		2	AW5	3	Building Construction I: MFMAG31S04-EN
1	Geotechnics II	MFGTH32S04-EN	2	2		ESE	4	Geotechnics I.: MFGTH31S04-EN
1	Mechanics Final Exam	MFMEC30S00-EN				FE	0	MFMEC33S05-EN
1	Reinforced Concrete Structures II	MFVBS32SS3-EN	2		1	ESE	3	Reinforced Concrete Structures I: MFVBS31S03-EN
1	State administration and Law	MFJOG31X02-EN	2			ESE	2	None
1	Steel Structures II	MFACS32SS3-EN	2	1		ESE	3	Steel Structures I: MFACS31S03-EN
1	Theory of Girders I	MFTST31SS3-EN	1	2		ESE	3	Mechanics III (Dynamics): MFMEC33S05-EN
1	Water management and hydraulic structures	MFVIZ31S04 -EN	2	2		AW5	4	Public Works I.: MFKOZ31S04-EN, Hydrology and hydrogeology I.: MFHIO31S04-EN

### Compulsory courses for the 3<sup>rd</sup> year

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Construction Management II	MFKIV32SS3-EN	1	2		AW5	3	Construction Management I: MFKIV31S03-EN
2	FEM modelling I	MFVEM31SS4-EN		4		AW5	4	Steel structures II: MFACS32SS3-EN, Reinforced Concrete Structures II: MFVBS32SS3-EN, Theory of Girders I: MFTST31SS3-EN
2	Geotechnics III	MFGTH33S04-EN	2	2		ESE	4	Geotechnics I: MFGTH31S04-EN
2	Management for Engineers	MFMAM31X04-EN	1	3		AW5	4	None
2	Reinforced Concrete Structures III	MFVBS33SS3-EN	2		1	ESE	3	Reinforced Concrete Structures II: MFVBS32SS3-EN
2	Steel Structures III	MFACS33SS3-EN	2	1		ESE	3	Steel Structures II: MFACS32SS3-EN
2	Theory of Girders II	MFTST32SS3-EN	1	2		ESE	3	Theory of Girders I: MFTST31SS3-EN
2	Timber & Masonry Structures	MFFFS31S03-EN	2	1		AW5	3	Theory of Design: MFMEEL31S04-EN

**Compulsory courses for the 4<sup>th</sup> year**

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Bridges & Structures	MF MUT31S04-EN	2		2	ESE	4	Geotechnics III: MFGTH33S04-EN
1	Composite Structures	MF MOS31SM3-EN	2			AW5	3	Steel structures II: MFACS32SS3-EN, Reinforced Concrete Structures II: MFVBS32SS3-EN
1	Design of Buildings II	MFETE32SM3-EN	1		2	ESE	3	Design of Buildings I: MFETE31SS3-EN
1	Engineering Timber Structures	MF MFS31SM3-EN	2			AW5	3	Timber & Masonry Structures MFFFS31S03-EN
1	Geotechnics IV	MFGTH34SS3-EN	2			ESE	3	Geotechnics II (Earthworks): MFGTH32S04-EN and Geotechnics III. (Foundation Engineering)
1	Reinforced Concrete Buildings	MF MVB31SM3-EN	2		1	AW5	3	Reinforced Concrete Structures III: MFVBS33SS3-EN
1	Steel buildings	MF MAC31SM3-EN	2	1		ESE	3	Steel Structures III: MFACS33SS3-EN
1	Strengthening of Structures	MF SZM31SM3-EN	2			AW5	3	Steel structures III: MFACS33SS3-EN, Reinforced Concrete Structures III: MFVBS33SS3-EN

**Compulsory courses for the 4<sup>th</sup> year**

Sem.	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Structural Engineering Final Exam	MFKSS31SS0-EN				FE	0	None

## CHAPTER 8

### ACADEMIC PROGRAM FOR CIVIL ENGINEERING BSC

## Basics of Natural Sciences

Subject: **BASICS OF ENGINEERING CALCULATIONS**

Coordinator: **Imre Kocsis**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Seminar: **2**

#### 1<sup>st</sup> week:

**Seminar:** Fractions, decimals. A ratio, a proportion, a percentage. Calculations with fractions. Handling exponents. Rounding and estimating. Normal forms of numbers (scientific notation). Basic number sets. Prime numbers, prime factorization.

#### 2<sup>nd</sup> week:

**Seminar:** Points, lines, planes, segments, rays. Distance between points. Angles, types of angles. Parallel lines and transversals. Types of triangles (scalene, isosceles, equilateral, right). Congruent triangles. Centres of triangles.

#### 3<sup>rd</sup> week:

**Seminar:** Polygons, interior and exterior angles of a polygon. Quadrilaterals. Characteristics of parallelograms. Kites and trapezoids.

#### 4<sup>th</sup> week:

**Seminar:** Transformations (reflection, rotation, translation). Similar polygons, scale factor. Similar triangles. Right Triangles. Pythagorean theorem.

#### 5<sup>th</sup> week:

**Seminar:** Parts of a circle, angles. Perimeter and area: triangles, quadrilaterals, general polygons, circles. Surface area and volume: polyhedral, prisms, cylinders, pyramids, cones, spheres.

#### 6<sup>th</sup> week:

**Seminar:** Basic functions (polynomial, power, exponential, logarithmic, trigonometric), graphs and properties. Shifting and scaling.

#### 7<sup>th</sup> week:

**Seminar:** Linear functions equations and inequalities. Graphical solution. Rates of change. Quadratic polynomials equations and inequalities. Factoring.

#### 8<sup>th</sup> week:

**Seminar:** Test 1.  
**Self Control Test**

#### 9<sup>th</sup> week:

**Seminar:** Exponential, logarithmic, trigonometric equations and inequalities.

#### 10<sup>th</sup> week:

**Seminar:** Random events. Probability. Classical probability formula. Conditional probability.

#### 11<sup>th</sup> week:

**Seminar:** Empirical probabilities based on specific sample data. Percentile rank of an item in a data set, first, second, and third quartiles.

#### 12<sup>th</sup> week:

**Seminar:** A histogram, a cumulative frequency histogram, a box-plot diagram. a scatter plot.

#### 13<sup>th</sup> week:

**Seminar:** Discrete and continuous random variables. a mean, a median, a mode, a standard deviation, a variance.

#### 14<sup>th</sup> week:

**Seminar:** A linear regression model. Normal distribution.

#### 15<sup>th</sup> week:

**Seminar:** Test 2. **Self Control Test**

## Requirements

Topics:

Numbers and Basic Operations: Fractions, decimals. A ratio, a proportion, a percentage. Calculations with fractions. Handling exponents. Rounding and estimating. Normal forms of numbers (scientific notation). Prime numbers, prime factorization. Geometry: Points, lines, planes, segments, rays. Distance between points. Angles, types of angles. Parallel lines and transversals. Vectors, vector operations. Types of triangles (scalene, isosceles, equilateral, right). Congruent triangles. Centers of triangles. Polygons, interior and exterior angles of a polygon. Quadrilaterals. Characteristics of parallelograms. Kites and trapezoids. Transformations (reflection, rotation, translation). Similar polygons, a scale factor. Similar triangles. Right triangles. Pythagorean theorem. Parts of a circle, angles. Perimeter and area: triangle, quadrilaterals, general polygons, circles. Surface area and volume: polyhedral, prisms, cylinders, pyramids, cones, spheres. Constructing lines, angles, polygons, circles and arcs. Functions, equations and inequalities: Basic functions (polynomial, power, exponential, logarithmic, trigonometric), graphs and properties. Shifting and scaling. Linear functions equations and inequalities. Graphical solution. Rates of change (examples in physics). Quadratic polynomials equations and inequalities. Factoring. Exponential, logarithmic, trigonometric equations and inequalities. Statistics: Random events. Probability. Classical probability formulas. Conditional probability. Empirical probabilities based on specific sample data. Percentile rank of an item in a data set, first, second, and third quartiles. Histogram, cumulative frequency histogram, a box-plot diagram. A scatter plot. Discrete and continuous random variables. Mean, median, mode, standard deviation, variance. Linear regression models. Normal distribution. A, for a signature: Participation at practice is compulsory. Students must attend practicals and may not miss more than three times during the semester. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests. B, for a grade: The course ends in a mid-term grade. The grade for the test 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)

### Required reading materials

*Mitas, P.J.: Basic Math Quick Reference eBook*

ISBN: 978-0-615-27390-7

*Zegarelli, M.: Basic Math & Pre-Algebra for dummies*

Wiley Publishing, Inc.,

*Freeman, C.M.: Hand-On-Geometry*

Prufrock Press Inc., ISBN: 978-1-59363-555-8

*Alexander, D.C., Koeberlein, A.: Elementary Geometry for College Students*

BROOKS/COLE, 2011.

*Larson, R., Farber, B.: Elementary Statistics - Picturing the World*

Prentice Hall, 2012.



Subject: **MATHEMATICS I**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **3**

**1<sup>st</sup> week:**

**Lecture:** Arithmetic of real and complex numbers.

**Seminar:** Arithmetic of real and complex numbers.

**2<sup>nd</sup> week:**

**Lecture:** Algebra of vectors in 2 and 3 dimensions.

**Seminar:** Algebra of vectors in 2 and 3 dimensions.

**3<sup>rd</sup> week:**

**Lecture:** Coordinate systems. Functions and their graphs.

**Seminar:** Coordinate systems. Functions and their graphs.

**4<sup>th</sup> week:**

**Lecture:** Composition of functions. Inverse functions.

**Seminar:** Composition of functions. Inverse functions.

**5<sup>th</sup> week:**

**Lecture:** Sequences and series of numbers, and convergence criteria.

**Seminar:** Sequences and series of numbers, and convergence criteria.

**6<sup>th</sup> week:**

**Lecture:** Sequences and series of functions, power series, convergence criteria.

**Seminar:** Sequences and series of functions, power series, convergence criteria.

**7<sup>th</sup> week:**

**Lecture:** Real functions. Polynomials.

**Seminar:** Real functions. Polynomials.

**8<sup>th</sup> week:**

**Lecture:** The mid-term test.

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Limits, continuity. Interpolation.

**Seminar:** Limits, continuity. Interpolation.

**10<sup>th</sup> week:**

**Lecture:** Arithmetic of matrices. Determinants.

**Seminar:** Arithmetic of matrices. Determinants.

**11<sup>th</sup> week:**

**Lecture:** Systems of linear equations. Cramer's rule.

**Seminar:** Systems of linear equations. Cramer's rule.

**12<sup>th</sup> week:**

**Lecture:** Linear space, subspace, generating systems.

**Seminar:** Linear space, subspace, generating systems.

**13<sup>th</sup> week:**

**Lecture:** Bases, orthogonal and orthonormal bases.

**Seminar:** Bases, orthogonal and orthonormal bases.

**14<sup>th</sup> week:**

**Lecture:** Linear transformations, eigenvectors, eigenvalues.

**Seminar:** Linear transformations, eigenvectors, eigenvalues.

**15<sup>th</sup> week:**

**Lecture:** The End-term test.

**Self Control Test**

## Requirements

Topics: Arithmetic of real and complex numbers. Algebra of vectors in 2 and 3 dimensions. Coordinate systems. Functions and their graphs. Composition of functions. Inverse functions. Sequences and series of numbers, and convergence criteria. Sequences and series of functions, power series, convergence criteria. Real functions. Polynomials. Limits, continuity. Interpolation. Arithmetic of matrices. Determinants. Systems of linear equations. Cramer's rule. Linear space, subspace, generating systems, bases, orthogonal and orthonormal bases. Linear transformations, eigenvectors, eigenvalues.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practices and may not miss more than three practicals during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. The attendance on practicals will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade: The course ends in an exam grade (ESE). The grade for the test is given according to the following table: Score Grade 0-49 fail (1) 50-64 pass (2) 65-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5)

## Required reading materials

*S. Minton: Calculus Concept and Connections*

McGraw Hill , 2006. ISBN: 0-07111200-6

*Addison Wesley : Thomas' Calculus*

11th.2005. ISBN: 0-321-24335-8

Subject: **MATHEMATICS II**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **3**

Practical: **5**

### 1<sup>st</sup> week:

**Lecture:** Derivatives, linear approximation. Differentiation rules.

**Seminar:** Derivatives, linear approximation. Differentiation rules.

### 2<sup>nd</sup> week:

**Lecture:** Applications in physics. Taylor polynomials.

**Seminar:** Applications in physics. Taylor polynomials.

### 3<sup>rd</sup> week:

**Lecture:** Extreme values. Monotony and convexity testing.

**Seminar:** Extreme values. Monotony and convexity testing.

### 4<sup>th</sup> week:

**Lecture:** Mean value theorems, l'Hospital's rule, Taylor's theorem.

**Seminar:** Mean value theorems, l'Hospital's rule, Taylor's theorem.

**5<sup>th</sup> week:**

**Lecture:** Antiderivatives. Integration by parts and by substitution.

**Seminar:** Antiderivatives. Integration by parts and by substitution.

**6<sup>th</sup> week:**

**Lecture:** Integration in special classes of functions.

**Seminar:** Integration in special classes of functions.

**7<sup>th</sup> week:**

**Lecture:** The Riemann integral. The Newton-Leibniz theorem. Improper integrals.

**Seminar:** The Riemann integral. The Newton-Leibniz theorem. Improper integrals.

**8<sup>th</sup> week:**

**Lecture:** Mid-term test.

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Applications of the integration in geometry and physics. Fourier series.

**Seminar:** Applications of the integration in geometry and physics. Fourier series.

**10<sup>th</sup> week:**

**Lecture:** Classification of differential equations. Initial value problems, boundary value problems. First order differential equations.

**Seminar:** Classification of differential equations. Initial value problems, boundary value problems. First order differential equations.

**11<sup>th</sup> week:**

**Lecture:** Slope fields. Euler's and Runge-Kutta methods. Problems leading to differential equations.

**Seminar:** Slope fields. Euler's and Runge-Kutta methods. Problems leading to differential equations.

**12<sup>th</sup> week:**

**Lecture:** Problems leading to differential equations. Separable differential equations.

**Seminar:** Problems leading to differential equations. Separable differential equations.

**13<sup>th</sup> week:**

**Lecture:** Second order differential equations. The theory of linear differential equations.

**Seminar:** Second order differential equations. The theory of linear differential equations.

**14<sup>th</sup> week:**

**Lecture:** Method of variation of parameters, method of undetermined coefficients, application of the Laplace transform.

**Seminar:** Method of variation of parameters, method of undetermined coefficients, application of the Laplace transform.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practicals 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. A student can't make up any practice with another group. Attendance at practicals will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, to be discussed with the tutor. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their 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 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade: The course ends in an exam grade (ESE). The grade for the test is given according to

the following table: Score Grade 0-49 fail (1) 50-64 pass (2) 65-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5)

### Required reading materials

*Addison Wesley : Thomas' Calculus*

11th.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

Subject: **MATHEMATICS III**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **2**

#### 1<sup>st</sup> week:

**Lecture:** Functions of several variables, and scalar fields.

**Seminar:** Functions of several variables, and scalar fields.

#### 2<sup>nd</sup> week:

**Lecture:** Continuity, differential calculus, partial derivatives, gradients.

**Seminar:** Continuity, differential calculus, partial derivatives, gradients.

#### 3<sup>rd</sup> week:

**Lecture:** Young's theorem. Local and global extrema.

**Seminar:** Young's theorem. Local and global extrema.

#### 4<sup>th</sup> week:

**Lecture:** Double and triple integrals. The Jacobian determinant.

**Seminar:** Double and triple integrals. The Jacobian determinant.

#### 5<sup>th</sup> week:

**Lecture:** Vector-valued functions and curves.

**Seminar:** Vector-valued functions and curves.

#### 6<sup>th</sup> week:

**Lecture:** Derivatives. Linear approximation.

**Seminar:** Derivatives. Linear approximation.

#### 7<sup>th</sup> week:

**Lecture:** Curvature, torsion.

**Seminar:** Curvature, torsion.

#### 8<sup>th</sup> week:

**Lecture:** Mid-term test

**Self Control Test**

#### 9<sup>th</sup> week:

**Lecture:** Motion in space, velocity, acceleration.

**Seminar:** Motion in space, velocity, acceleration.

#### 10<sup>th</sup> week:

**Lecture:** Vector fields. Derivatives. Divergence and curl.

**Seminar:** Vector fields. Derivatives. Divergence and curl.

#### 11<sup>th</sup> week:

**Lecture:** Line and surface integrals.

**Seminar:** Line and surface integrals.

#### 12<sup>th</sup> week:

**Lecture:** The theorems of Gauss and Stokes, Green's formulae.

**Seminar:** The theorems of Gauss and Stokes, Green's formulae.

**13<sup>th</sup> week:**

**Lecture:** Conservative vector fields, potentials.

**Seminar:** Conservative vector fields, potentials.

**14<sup>th</sup> week:**

**Lecture:** Applications in physics.

**Seminar:** Applications in physics.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

Topics: Functions of several variables, and scalar fields. Continuity, differential and integral calculus, partial derivatives, gradients, and Young's theorem. Local and global extrema. Double and triple integrals. The Jacobian determinant. Vector-valued functions and curves. Derivatives. Linear approximation. Curvature, torsion. Motion in space, velocity, acceleration. Vector fields. Derivatives. Divergence and curl. Line and surface integrals. The theorems of Gauss and Stokes, Green's formulae. Conservative vector fields, potentials. Applications in physics.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practicals 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. A student can't make up any practice with another group. Attendance at practice class will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, to be discussed with the tutor. Active participation is evaluated by the teacher in every class. If a student's behavior 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 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade: The course ends in an exam grade (ESE). The grade for the test is given according to the following table: Score Grade 0-49 fail (1) 50-64 pass (2) 65-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5)

### Required reading materials

*Addison Wesley : Thomas' Calculus*

11th.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

Subject: **MATHEMATICS FINAL EXAM**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Subject: **MECHANICS I**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction, definitions, concurrent forces in a plane

**Practical:** Forces in a plane

**2<sup>nd</sup> week:**

**Lecture:** Forces in a plane

**Practical:** Forces in a plane

**3<sup>rd</sup> week:**

**Lecture:** Simple structures, statical determinacy

**Practical:** Simple structure

**4<sup>th</sup> week:**

**Lecture:** kinds of compound structure

**Practical:** Compound structure, Issuing task 1.

**5<sup>th</sup> week:**

**Lecture:** Truss analysis I.

**Practical:** Truss analysis I.

**6<sup>th</sup> week:**

**Lecture:** Truss analysis II.

**Practical:** Truss analysis II.

**7<sup>th</sup> week:**

**Lecture:** Distributed forces in a plane

**Practical:** Summary of the practice.

**8<sup>th</sup> week:**

**Lecture:** Drawing week, Submitting task 1.

**Practical:** Mid-term test

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Internal force diagrams

**Practical:** Internal force diagrams

**10<sup>th</sup> week:**

**Lecture:** Internal force diagrams II

**Practical:** Internal force diagrams III

**11<sup>th</sup> week:**

**Lecture:** Internal force diagrams III

**Practical:** Internal force diagrams III

**12<sup>th</sup> week:**

**Lecture:** Force systems in three dimensional space.

**Practical:** Force systems in three dimensional space.

**13<sup>th</sup> week:**

**Lecture:** Force systems in three dimensional space.

**Practical:** Force systems in three dimensional space.

**14<sup>th</sup> week:**

**Lecture:** kinds of structure in three dimensional space

**Practical:** kinds of structure in three dimensional space

**15<sup>th</sup> week:**

**Lecture:** Drawing week, Submitting task 2.

**Practical:** End-term test

**Self Control Test**

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 any practice class with another group. Attendance at practice will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring calculators to each practice class. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class.

During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to reach the minimum level of points on each test (60 %). Students have to submit all the tasks as scheduled minimum at a sufficient level. If the score of any test is

under 60%, the student once can take a retake test in both topics.

B, for a grade: The course ends in an examination grade (ESE) based on the points of the tasks, tests and exam. Based on points earned during the semester, 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)

### Required reading materials

*Ferdinand P. Beer, E. Russell Johnston and Phillip J. Cornwell: Vector Mechanics for Engineers*  
Hardcover, 2012. ISBN: 0077402324, 97800774

Subject: **MECHANICS II**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction to Strength of Materials  
Elastic beam model

**Seminar:** Introduction to Strength of Materials and Internal force diagrams (repetition)

**2<sup>nd</sup> week:**

**Lecture:** Moments of inertia, main directions

**Seminar:** Moments of inertia, main directions

**3<sup>rd</sup> week:**

**Lecture:** Tension/compression, simple shear

**Seminar:** Tension/compression, simple shear

**4<sup>th</sup> week:**

**Lecture:** Torsion, bending.

**Seminar:** Torsion, bending.

**5<sup>th</sup> week:**

**Lecture:** Unaxial bending. Kinds of stress and strain. Stress diagrams

**Seminar:** Unaxial bending. Kinds of stress and strain. Stress diagrams

**6<sup>th</sup> week:**

**Lecture:** Bending and shear

**Seminar:** Rating practice

**7<sup>th</sup> week:**

**Lecture:** Drawing week

**Seminar:** Drawing week

**8<sup>th</sup> week:**

**Lecture:** Mid-term test

**Seminar:** Bending and shearing

**9<sup>th</sup> week:**

**Lecture:** Stress and strain states, most important stress and strain.

**Seminar:** Stress and strain states, most important stress and strain.

**10<sup>th</sup> week:**

**Lecture:** Elastic and plastic torsional load bearing capacity of cylindrical bars.

**Seminar:** Elastic and plastic torsional load bearing capacity of cylindrical bars.

**11<sup>th</sup> week:**

**Lecture:** Buckling of columns. Energy methods (Betti's theorem). Stress Transformations.

**Seminar:** Buckling of columns. Energy methods (Betti's theorem). Stress Transformations.

**12<sup>th</sup> week:**

**Lecture:** Calculation of displacement

**Seminar:** Calculation of displacement

**14<sup>th</sup> week:**

**Lecture:** Mid-term test

**Seminar:** Summary of the practice

**15<sup>th</sup> week:**

**Lecture:** Drawing week

**Seminar:** Drawing week

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 any practice class with another group. Attendance at practice will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring calculators to each practice class. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class. Students have to submit all the tasks as scheduled minimum at a sufficient level.

During the semester there are two tests: test 1 in the 7th week and the test 2 in the 15th week. Students have to reach the minimum level of points on each test. If the score of any test is below 15 from 30 points, the student once can take a retake test in both topics.

B, for a grade: The course ends in an examination grade (ESE) based on the points of the tasks, tests and exam. Based on points earned during the semester, 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)

### Required reading materials

*Ferdinand P. Beer, E. Russel Johnston, Jr., John T. DeWolf : Mechanics of Materials*  
 4th. University of Connecticut , 2006. ISBN: 9780073107950  
*Budynas: Advanced Strength and Applied Stress Analysis*  
 2nd.1998. ISBN: 13978-0070089853

Subject: **MECHANICS III**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Kinematics of material point.

**Practical:** Solving tasks about kinematics of material point.

**2<sup>nd</sup> week:**

**Lecture:** Kinematics of rigid subjects.

**Practical:** Solving tasks about kinematics of rigid subjects.

**3<sup>rd</sup> week:**

**Lecture:** Kinetics of a material point.

**Practical:** Solving tasks about kinetics of a material point.

**4<sup>th</sup> week:**

**Lecture:** Kinetics of rigid subjects.

**Practical:** Solving tasks about kinetics of rigid subjects. Issuing task 1.

**5<sup>th</sup> week:**

**Lecture:** Simple collision problems.

**Practical:** Solving tasks about simple collision problems.

**6<sup>th</sup> week:**

**Lecture:** Central collision of moving mass and elastic structure.

**Practical:** Solving tasks about central collision of moving mass and elastic structure.



**7<sup>th</sup> week:**

**Lecture:** TEST 1

**Practical:** Solving tasks of TEST 1. Submitting task 1.

**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Free vibration problems with one degree of freedom.

**Practical:** Solving tasks about free vibration problems with one degree of freedom.

**9<sup>th</sup> week:**

**Lecture:** Forced vibration problems with one degree of freedom.

**Practical:** Solving tasks about forced vibration problems with one degree of freedom. Issuing task 2.

**10<sup>th</sup> week:**

**Lecture:** Free vibration problems with multi degrees of freedom.

**Practical:** Solving tasks about free vibration problems with multi degrees of freedom.

**11<sup>th</sup> week:**

**Lecture:** Forced vibration problems with multi

degrees of freedom.

**Practical:** Solving tasks about forced vibration problems with multi degrees of freedom.

**12<sup>th</sup> week:**

**Lecture:** Vibration forced by support motion

**Practical:** Solving tasks about vibration forced by support motion with one-, and more degrees of freedom.

**13<sup>th</sup> week:**

**Lecture:** Problems of earthquakes according to the Eurocode standards.

**Practical:** Solving tasks on problems of earthquakes according to the Eurocode standards.

**14<sup>th</sup> week:**

**Lecture:** Dynamic effects of wind according to the Eurocode standards.

**Practical:** Solving tasks on dynamic effects of wind according to the Eurocode standards.

**15<sup>th</sup> week:**

**Lecture:** TEST 2

**Practical:** Solving tasks of TEST 2. Submitting task 2.

**Self Control Test**

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 any practice class with another group. Attendance at practice will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring calculators to each practice class. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class.

During the semester there are two tests: test 1 in the 7th week and the test 2 in the 15th week. Students have to reach the minimum level of points on each test. If the score of any test is below 15 from 30 points, the student once can take a retake test in both topics.

B, for a grade: The course ends in an examination grade (ESE) based on the points of the tasks, tests and exam. Based on points earned during the semester, 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)

### Required reading materials

*BEER F.P., JOHNSTON E.R.: Dynamics*

## CHAPTER 8

---

McGraw-Hillcop , 1988. ISBN: 0-07-079926-1  
*TIMOSHENKO S.: Vibration problems in engineering*  
Wiley, 1974. ISBN: 0-471-87315-2  
*PESTEL E. C., THOMSON W. T.: Dynamics*  
McGraw-Hillcop , 1968.  
*HARRIS C. M., CREDE C. E.: Shock and vibration handbook*  
McGraw-Hillcop, 1988. ISBN: 0-07-026801-0

Subject: **MECHANICS FINAL EXAM**  
Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Subject: **TECHNICAL DRAWING I**  
Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester  
Lecture: **1**  
Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction to the multiview depiction  
**Seminar:** Introduction to the multiview depiction

**2<sup>nd</sup> week:**

**Lecture:** On regular solids  
**Seminar:** Truncated polyhedrons

**3<sup>rd</sup> week:**

**Lecture:** Introduction to the Monge's method of projecting  
**Seminar:** Introduction to the Monge's method of projecting

**4<sup>th</sup> week:**

**Lecture:** Intersection tasks I.  
**Seminar:** Intersection tasks I.

**5<sup>th</sup> week:**

**Lecture:** Intersection tasks II.  
**Seminar:** Intersection tasks II.

**6<sup>th</sup> week:**

**Lecture:** Methods of the replacing image-planes  
**Seminar:** Methods of the replacing image-planes

**7<sup>th</sup> week:**

**Lecture:** Mid-term test  
**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Metrical problems I.  
**Seminar:** Metrical problems I.

**9<sup>th</sup> week:**

**Lecture:** Metrical problems II.  
**Seminar:** Metrical problems II.

**10<sup>th</sup> week:**

**Lecture:** Polyhedrons: prisms and pyramids  
**Seminar:** Polyhedrons: prisms and pyramids

**11<sup>th</sup> week:**

**Lecture:** Intersection of the polyhedrons with lines and planes  
**Seminar:** Intersection of the polyhedrons with lines and planes

**12<sup>th</sup> week:**

**Lecture:** Intersection of two polyhedrons I.  
**Seminar:** Intersection of two polyhedrons I.

**13<sup>th</sup> week:**

**Lecture:** Intersection of two polyhedrons II.  
**Seminar:** Intersection of two polyhedrons II.

**14<sup>th</sup> week:**

**Lecture:** Curved surfaces  
**Seminar:** Curved surfaces

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

Topics: Monge's method of projecting: methods of projection, an image-plane system, representation of spatial elements, reconstruction. The fundamentals of intersections: line-plane and plane-plane intersections. Metrical problems: distance and angle tasks, perpendicularity, rotation of a plane to parallel to an image plane, methods of replacing image-planes, constructing an illustrative picture using new image-planes, visibility. Polyhedrons: their representation, their intersection with a line, plane and the other polyhedron. Curved surfaces: construction and representation of curved surfaces, their intersection with a line, a plane.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 practicals 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. Active participation is evaluated by the teacher in every class. If a student's behavior 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 is some homework related to each topic and there are two tests: the mid-term test is in the 7th week and the end-term test in the 15th week. Conditions for the signature: to reach the 50 % score on both tests. to hand the homeworks in time.

B, for a grade: The course ends in an mid-semester grade (AW5). During the exam period there is another test on all the topics of the semester. This test is accepted with minimum 50 % score. The total score of the semester is the sum of the scores of all tests (mid-term, end-term, exam) and the homework tasks, and the grade is given according to the following table: Score Grade 0-99 fail (1) 100-129 pass (2) 130-159 satisfactory (3) 160-179 good (4) 180-200 excellent (5)

### Required reading materials

*Vlasta Szivovicza: Descriptive geometry*

Self-published, Zagreb, Croatia, 2007. ISBN: 978-953-95667-0-6

*Paré, E. G.: Descriptive geometry*

Prentice Hall, 1997.

*Gordon, V. O.: A course in descriptive geometry*

Mir, 1980.

Subject: **TECHNICAL DRAWING II**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Lecture: **1**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction to the multiview depiction

**Seminar:** Introduction to the multiview depiction

**2<sup>nd</sup> week:**

**Lecture:** On the regular solids

**Seminar:** Truncated polyhedrons

**3<sup>rd</sup> week:**

**Lecture:** Introduction to the Monge's method of projecting

**Seminar:** Introduction to the Monge's method of projecting.

**4<sup>th</sup> week:**

**Lecture:** Intersection tasks I.

**Seminar:** Intersection tasks I.

**5<sup>th</sup> week:**

**Lecture:** Intersection tasks II.

**Seminar:** Intersection tasks II.

**6<sup>th</sup> week:**

**Lecture:** Methods of the replacing image-planes

**Seminar:** Methods of the replacing image-planes

**7<sup>th</sup> week:**

**Lecture:** Mid-term test

**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Metrical problems I.

**Seminar:** Metrical problems I.

**9<sup>th</sup> week:**

**Lecture:** Metrical problems II.

**Seminar:** Metrical problems II.

**10<sup>th</sup> week:**

**Lecture:** Polyhedrons: prisms and pyramids

**Seminar:** Polyhedrons: prisms and pyramids

**11<sup>th</sup> week:**

**Lecture:** Intersection of the polyhedrons with lines and planes

**Seminar:** Intersection of the polyhedrons with lines and planes

**12<sup>th</sup> week:**

**Lecture:** Intersection of two polyhedrons I.

**Seminar:** Intersection of two polyhedrons I.

**13<sup>th</sup> week:**

**Lecture:** Intersection of two polyhedrons II.

**Seminar:** Intersection of two polyhedrons II.

**14<sup>th</sup> week:**

**Lecture:** Curved surfaces

**Seminar:** Curved surfaces

**15<sup>th</sup> week:**

**Lecture:** End-term test

### Requirements

Topics: The series of lectures are based on the relevant standards. It reviews the fundamental rules and formal requirements of the technical drawing, the 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 tolerancing, 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.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student 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 practicals will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course to each occasion. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence because of the lack of active participation in class. Students have to submit all the six drawing tasks as scheduled minimum on 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. 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: - the average grade of the six drawing tasks - the 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 table: 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 of the whole semester material.

### Required reading materials

*Vlasta Szivovicza: Descriptive geometry*

Self-published, Zagreb, Croatia, 2007. ISBN: 978-953-95667-0-6

*Paré, E. G.: Descriptive geometry*

Prentice Hall, 1997.

*Gordon, V. O.: A course in descriptive geometry*

Mir, 1980.

Subject: **TECHNICAL CHEMISTRY**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Sciences and chemistry, Quantitative laws in chemistry, basic concepts of stoichiometry

**2<sup>nd</sup> week:**

**Lecture:** Characterization of macroscopic chemical systems, states of matter

**3<sup>rd</sup> week:**

**Lecture:** Solutions

**4<sup>th</sup> week:**

**Lecture:** Thermochemistry

**5<sup>th</sup> week:**

**Lecture:** Reaction rates

**6<sup>th</sup> week:**

**Lecture:** Equilibrium

**7<sup>th</sup> week:**

**Lecture:** Acid-base equilibriums, Heterogeneous equilibriums

**8<sup>th</sup> week:**

**Lecture:** Redox reactions

**9<sup>th</sup> week:**

**Lecture:** The structure of atoms

**10<sup>th</sup> week:**

**Lecture:** The structure of the nucleus

**11<sup>th</sup> week:**

**Lecture:** Quantum mechanical model of the atom

**12<sup>th</sup> week:**

**Lecture:** The chemical bond

**13<sup>th</sup> week:**

**Lecture:** Structures and bonding in chemical systems

**14<sup>th</sup> week:**

**Lecture:** Principles of determination a chemical structure

**15<sup>th</sup> week:**

**Lecture:** Theoretical models of solid materials: band theory and its applications to metals.

Superconductivity and its applications.  
Commercial methods of metal production.

### Requirements

A, for a signature: Participation at practicals is compulsory. Students must attend practicals and may not miss more than three practicals 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 practicals 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 practicals must be made up for at a later date, being discussed with the tutor.

B, for a grade (ESE): A test after the completion of the semester, no midterm tests, sample test questions provided on the website in the beginning of December. Website: <http://www.inorg.unideb.hu/> All lecture materials are posted at least one day before the lecture. The grade for each test 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) If the score of any test is below 60, once students can take a retake test of the whole semester material.

### Required reading materials

*Tom Holme, Larry Brown: Chemistry for Engineering Student*

Brooks Cole, 2006. ISBN: 0534389740

*James O. Glanville: General Chemistry for Engineers*

Preliminary Edition . Prentice Hall, 2000. ISBN: 978-0130325143

*Darrell Ebbing, Steven D. Gammon: General Chemistry*

9th. Brooks Cole, 2007. ISBN: 978-06188574871

*John McMurry – Robert C. Fay: Chemistry*

6th. Prentice Hall , ISBN: 0321704959

Subject: **ENGINEERING PHYSICS**

Coordinator: **Zsolt Tiba**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** The basics of kinematics and dynamics of particles: Giving the position of a particle.

**2<sup>nd</sup> week:**

**Lecture:** Position-time function, velocity and acceleration.

**3<sup>rd</sup> week:**

**Lecture:** Newton's laws. Types of forces.

**4<sup>th</sup> week:**

**Lecture:** The concept of mechanical work,

potential and kinetic energy.

**5<sup>th</sup> week:**

**Lecture:** Work-energy theorem.

**6<sup>th</sup> week:**

**Lecture:** The basics of electricity and magnetism. Electrostatics, electrical potential.

**7<sup>th</sup> week:**

**Lecture:** electric fields around conductors, capacity and capacitors.

**8<sup>th</sup> week:**

**Lecture:** Mid-term test.

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Transport processes. Electric current, AD circuits.

**10<sup>th</sup> week:**

**Lecture:** Heat transfer: thermal conductions, convection and radiation.

**11<sup>th</sup> week:**

**Lecture:** The fields of moving charges

**12<sup>th</sup> week:**

**Lecture:** Magnetic fields, electromagnetic induction.

**13<sup>th</sup> week:**

**Lecture:** Maxwell's equations.

**14<sup>th</sup> week:**

**Lecture:** AC circuits, electric and magnetic fields in matter.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

Topics: The basics of kinematics and dynamics of particles. Giving the position of a particle. Position-time function, velocity and acceleration. Newton's laws. Types of forces. The concept of mechanical work, potential and kinetic energy. Work-energy theorem. The basics of electricity and magnetism. Transport processes. Electrostatics, electrical potential, electric fields around conductors, capacity and capacitors. Transport processes. Electric current, AD circuits. A heat transfer: thermal conduction, convection and radiation. The fields of moving charges, magnetic fields, electromagnetic induction and Maxwell's equations, AC circuits, electric and magnetic fields in matter.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practicals 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. A student can't make up a practice with another group. The attendance at practicals will be recorded by the practice leader. Being late is equivalent with 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, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If a student's behavior 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 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade: The course ends in an exam grade (ESE). The grade for the test is given according to the following table: Score Grade 0-49 fail (1) 50-64 pass (2) 65-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5)

### Required reading materials

*Alvin Halpern : 3,000 Solved Problems in Physics (SCHAUM'S SOLVED PROBLEM SERIES)*

McGraw-Hill, 1988. ISBN: 0-07-025734-5

*Michael Browne : Physics for Engineering and Science*

McGraw-Hill, 1999. ISBN: 0-07-161399-6

*Robert Balmer: Thermo-dynamics, 868 pages*

Jaico Publishing House , 2006. ISBN: 817224262X

Subject: **INFORMATICS FOR ENGINEERS I**

Coordinator: **Mária Krauszné Princz**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Seminar: **2**

**1<sup>st</sup> week:**

**Seminar:** Introduction to informatics.

**2<sup>nd</sup> week:**

**Seminar:** Computer structures. Operating systems.

**3<sup>rd</sup> week:**

**Seminar:** Computer networks, the Internet.

**4<sup>th</sup> week:**

**Seminar:** Theoretical and practical data structures.

**5<sup>th</sup> week:**

**Seminar:** Algorithms.

**6<sup>th</sup> week:**

**Seminar:** Spreadsheets: entering data, records, fields, creating a table.

**7<sup>th</sup> week:**

**Seminar:** Sorting and filtering data.

**8<sup>th</sup> week:**

**Seminar:** Mid-term test.

**Self Control Test**

**9<sup>th</sup> week:**

**Seminar:** Expanding databases, formatting databases.

**10<sup>th</sup> week:**

**Seminar:** Relational databases.

**11<sup>th</sup> week:**

**Seminar:** SQL language.

**12<sup>th</sup> week:**

**Seminar:** Normalizing databases.

**13<sup>th</sup> week:**

**Seminar:** Securing databases (confidentiality, integrity and availability).

**14<sup>th</sup> week:**

**Seminar:** Keys, transactions.

**15<sup>th</sup> week:**

**Seminar:** End-term test

**Self Control Test**

## Requirements

Topics: Introduction to informatics. Computer structures. Operating systems. Computer networks, the Internet. Theoretical and practical data structures. Algorithms. Spreadsheets: entering data, records, fields, creating a table, sorting and filtering data, expanding databases, formatting databases. Relational databases, SQL language, normalizing databases, securing databases (confidentiality, integrity and availability), keys, transactions.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practices and may not miss more than three practicals during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up a practice with another group. Attendance at practicals will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of



active participation in class.

During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade: The course ends in a mid-semester grade (AW5). Based on the average of the marks of the tests the grade for the tests is given according to the following table: Score Grade 0-49 fail (1) 50-64 pass (2) 65-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5)

### Required reading materials

*J. Walkenbach: Excel 2007*

Wiley Publishing Inc.,

*C. N. Prague, M. R. Irwin, J. Reardon: Access 2003 Bible*

Wiley Publishing Inc., 2003.

Subject: **INFORMATICS FOR ENGINEERS II**

Coordinator: **Mária Krauszné Princz**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Seminar: **2**

**1<sup>st</sup> week:**

**Seminar:** Database basics. Elements of relational databases: tables, records, fields, keys, primary keys, indexes. Relationship between tables, relationship types. A user interface of software.

**2<sup>nd</sup> week:**

**Seminar:** Create a new database. Create and import tables. Data types. Create relations between tables. Referential integrity. Insert, delete, update records, fields.

**3<sup>rd</sup> week:**

**Seminar:** Format. Input masks. Fast finding, Filtering, and Sorting Data. Queries (Select, Crosstab). Calculated fields. Summarizing Data.

**4<sup>th</sup> week:**

**Seminar:** Queries (Making table queries, appending queries, Updating queries, deleting queries)

**5<sup>th</sup> week:**

**Seminar:** Creating forms using the Form wizard. Creating reports using the Report wizard. Formatting a report.

**6<sup>th</sup> week:**

**Seminar:** Modeling and creating a new database. Practicing the learned material.

**7<sup>th</sup> week:**

**Seminar:** 1<sup>st</sup> Mid-term exam.

**Self Control Test**

**8<sup>th</sup> week:**

**Seminar:** 2<sup>nd</sup> module: LABVIEW Virtual instruments. A user interface of software. Main components: a front Panel, a block Diagram, an icon and a connector pane. Data types. Elements of a block diagram: nodes, functions, subVIs.

**9<sup>th</sup> week:**

**Seminar:** A data flow model. Troubleshooting and debugging. Decision making: using selection. Using case structure.

**10<sup>th</sup> week:**

**Seminar:** Loops: While loop. For Loop. Iterative data transfer: Use Shift register. Timing.

**11<sup>th</sup> week:**

**Seminar:** Modularity. Functions and SubVIs. Three types of Functions: ExpressVIs, Standard VIs, Functions. Creating SubVIs.

**12<sup>th</sup> week:**

**Seminar:** File I/O. Graph Indicators.

**13<sup>th</sup> week:**

**Seminar:** Create codes. Practice the learned material.

**14<sup>th</sup> week:**

**Seminar:** 2<sup>nd</sup> Mid-term exam.

**Self Control Test**

**15<sup>th</sup> week:**

**Seminar:** Make up or improve grades: End-term exam.

**Requirements**

A, for a signature: Participation at practicals is compulsory. Students have to attend the practicals and mustn't miss more than three occasions during the semester. In case a student does more so, the subject will not be signed and the student must repeat the course. Attendance at practicals will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented.

B, for a grade (AW5): 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 % satisfactory (3) 76-88 % good (4) 89-100 % excellent (5) Both modules must be obtained at least pass (grade 2). 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 based on 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).

**Required reading materials**

*J. Walkenbach: Excel 2007*

Wiley Publishing Inc.,

*C. N. Prague, M. R. Irwin, J. Reardon: Access 2003 Bible*

Wiley Publishing Inc., 2003.

**Economics and Humanities**

Subject: **STATE ADMINISTRATION AND LAW**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** Introducing the law systems of the world, especially the common law and the e continental law system by explaining details of the main characteristics of the two systems.

**2<sup>nd</sup> week:**

**Lecture:** The constitutional basics of the municipality structure, state organization, municipality levels, basic civil rights, a historical

overview of the civil institutions. Operation of municipalities, their organization system, statutory supervision, and the major rules and regulations of the municipal, state and administrative procedures

**3<sup>rd</sup> week:**

**Lecture:** The main characteristics and structure of the Hungarian Law System. The sources of law.

**4<sup>th</sup> week:**

**Lecture:** The main rules of the administration system.

**5<sup>th</sup> week:**

**Lecture:** The major rules of commercial law and proprietary rights. The major forms of responsibility (compensation, indemnity) related to the activity, and general rules and regulations of concluding a contract.

**6<sup>th</sup> week:**

**Lecture:** The major forms of responsibility (compensation, indemnity) related to the activity, and general rules and regulations of concluding a contract.

**7<sup>th</sup> week:**

**Lecture:** The basics of contract law (written and oral contracts, the contracts of corporations)

**8<sup>th</sup> week:**

**Lecture:** Mid-term test  
**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** The evolution, history and development of the European integration: the integration issue after the second world war.

**10<sup>th</sup> week:**

**Lecture:** The Rome treaty and the establishment of the European Economic Community. .; The EU after Maastricht, new enlargements, the Amsterdam Treaty, and the Treaty of Nice, the further enlargements with the Eastern European countries, The Lisbon Treaty, the future of the EU.

**11<sup>th</sup> week:**

**Lecture:** The law of the European Union: the Community law, the sources of the Community law (primary and secondary legal sources, and other sources) The features of the Community legal system.

**12<sup>th</sup> week:**

**Lecture:** The European Court of Justice. Human

rights and the Universal Declaration of Human Rights.

**13<sup>th</sup> week:**

**Lecture:** The characteristics of the Hungarian municipality structure in light of the EU municipality systems. The sources of law in the EU.

**14<sup>th</sup> week:**

**Lecture:** Informal conversation with the students about their homeland's law system.

**15<sup>th</sup> week:**

**Lecture:** Consultation

## Requirements

Topics: Legal systems of the world, civil and human rights, the main characteristics and structure of the Hungarian Law System, major rules of commercial law and proprietary rights, evolution, history and development of the European integration.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practicals 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. A student can't make up a practice with another group. Attendance at practicals will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade: The course ends in mid-semester grade (AW5) based on the 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 table: 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 of the whole semester material.

## Required reading materials

*Zoltán Horváth: Handbook on the European Union*

HVG-ORAC, 2011.

*Péter Smuk: The transformation of the Hungarian Legal System 2010-2013*

Complex, 2013.

Subject: **ECONOMICS FOR ENGINEERS**

Coordinator: **Judit T. Kiss**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **3**

### 1<sup>st</sup> week:

**Lecture:** Introduction to economics. The method of economics. Microeconomics and Macroeconomics. Introduction to Macroeconomics. Economic Policy and economic problems. Economics in practice.

### 2<sup>nd</sup> week:

**Lecture:** Measuring national output and national income (Gross Output, Gross Domestic Product, calculating GDP, real versus nominal GDP, the components of the GDP, the expenditure approach, the income approach, GDP deflator, Gross National Income, and Gross National Disposable income). Calculation exercises.

### 3<sup>rd</sup> week:

**Lecture:** Measuring the cost of living (GDP and social welfare, the Consumer Price Index, GDP deflator versus CPI, real and nominal interest rates. Sustainable development). Calculation exercises.

### 4<sup>th</sup> week:

**Lecture:** The Keynesian Theory of consumption, consumption function, marginal propensity to consume, planned investment, saving function, marginal propensity to saving, aggregate output, determination of equilibrium output, the multiplier, IS curve. Calculation exercises.

**5<sup>th</sup> week:**

**Lecture:** The government and fiscal policy. Government purchases, taxes, disposable income, government budget deficits and surpluses, determination of equilibrium output, fiscal policy, the government spending multiplier, the tax multiplier. Average tax rates, tax wedges, and marginal tax rates. Calculation exercises.

**6<sup>th</sup> week:**

**Lecture:** Open-Economy, Equilibrium output in an Open Economy, net exports. Imports and exports and Trade Feedback effect. Calculation exercises.

**7<sup>th</sup> week:**

**Lecture:** Mid-term test. The meaning of money, the functions of money, measuring the supply of money. The creation of money, required reserve ratio. The money multiplier. Open market operations. Calculation exercises.

**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Demanding money. Supplying and demanding in the money market. The equilibrium interest rates. The IS-LM model. The equilibrium price-level.

**9<sup>th</sup> week:**

**Lecture:** Aggregate demand and aggregate supply. The effects of a shift in aggregate demanding. Labour market. Labour demand and supply curve. Calculation exercises.

**10<sup>th</sup> week:**

**Lecture:** The demand for labour, the supply of labour, labour force, working-age population, active and inactive population, labour participation rate, Unemployment, the unemployment rate, the activity rate. Okun law. Calculation exercises.

**11<sup>th</sup> week:**

**Lecture:** Inflation; (Price level, inflation rate, definition and measuring of inflation, types and causes of inflation, The Philips curve). Calculation exercises.

**12<sup>th</sup> week:**

**Lecture:** Growth (sources of economic growth, increasing in the quality of labour, human capital, education and skills), Economic growth around the world.

**13<sup>th</sup> week:**

**Lecture:** Basic tools of finance. Investment and interest rates (measuring the time value of money, future values and present values, compounding, trading off between risk and return, the efficient market hypothesis). Investments analysis. Calculation exercises.

**14<sup>th</sup> week:**

**Lecture:** Comparative analysis. Case studies.

**15<sup>th</sup> week:**

**Lecture:** End-term test  
**Self Control Test**

**Requirements**

Topics: This course focuses on the theory and application of the following: Measuring national income and output (real vs. nominal GNP, GDP, NNP, NDP, the problem of double counting). Consumption and Investment. IS model. 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, supply and demand for money. Monetary policy (varieties and problems of monetary policy). IS-LM analysis: the integration of the goods and money market models. Aggregate demand and supply. Labour market. Unemployment and inflation.

A, for a signature: Attendance at lectures is recommended, but not compulsory.

B, for a grade: The course ends in an exam grade (ESE). Attendance at lectures is recommended, but not compulsory. During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 15th week. Based on the cumulative results of the 2 tests written in

Economics for Engineers, students are offered an exam grade. 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 (ESE) is according to the following table: Score Grade 0 - 49 fail (1) 50 - 62 pass (2) 63 - 75 satisfactory (3) 76 - 88 good (4) 89 - 100 excellent (5)

### Required reading materials

*T. KISS, J., : Introduction to Macroeconomics for Engineers and technical Managers*

Debrecen University Press, 2014. ISBN: 978 963 318 416 5

*SAMUELSON P.A., NORDHAUS W.D.: Economics*

18th. Academic Internet Publishers Inc., 2006. ISBN: 0072872055

*PARKIN, M., POWELL, M. & MATTHEWS, K. : Economics*

7th. Harlow: Addison, 2008. ISBN: 9780132041225

Subject: **MICROECONOMICS**

Coordinator: **Judit T. Kiss**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **1**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Demand and supply analyses. Demand curves, Supply curves; demand, supply and market equilibrium; shift in demand and supply.

**Seminar:** Calculating problems: equilibrium price and quantity; market demand and individual demand; shifts versus movements along the demand curve (supply curve); market supply and individual supply; shifts versus movements along the supply curve.

**2<sup>nd</sup> week:**

**Lecture:** Consumer theories, consumer preferences, cardinal ranking. Total utility, marginal utility. Principle of diminishing marginal utility. Indifference curves, diminishing marginal rate of substitution.

**Seminar:** Calculating problems: marginal utility, marginal rate of substitution. Indifference curves with diminishing (increasing marginal rate of substitution).

**3<sup>rd</sup> week:**

**Lecture:** Consumer choice, the budget constraint, budget line, optimal choice. The effects of a change in price, demand curve, the effects of a change in income, Engel curve.

Income and substitution effect.

**Seminar:** Calculating problems: determination of optimal choice, consumption basket, income and substitution effects. Understanding consumer surplus.

**4<sup>th</sup> week:**

**Lecture:** The 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.

**Seminar:** Application of elasticity of demand. Energy and price elasticity. Types of goods (substitutes, complements, independents).

**5<sup>th</sup> week:**

**Lecture:** Production. Inputs and production functions. Total product functions. Marginal and average product of labour.

**Seminar:** Calculating problems (average product of labour (capital), marginal products of labour (capital), relationship between marginal products and average products).

**7<sup>th</sup> week:**

**Lecture:** Costs of production. (Total, fixed and

variable costs, marginal and variable cost).  
Relationship between marginal and average cost.  
Total revenue, total profit curves.

**Seminar:** Costs of production. (Total, fixed and variable costs, marginal and variable cost).  
Relationship between marginal and average cost.  
Total revenue, total profit curves.

**8<sup>th</sup> week:**

**Lecture:** Perfectly competitive markets I. (main characteristics of perfect competition, profit-maximizing output, shut down and breakeven points, the competitive firm's supply curve).

**Seminar:** Calculating problems (marginal average, total revenue, average and marginal profits, profit-maximizing outputs, the marginal cost curve and the supply curve. Determination of the shut down and breakeven points).

**9<sup>th</sup> week:**

**Lecture:** Competitive markets II. Taxes and subsidies. Price ceilings, production quotas, tariffs.

**Seminar:** Calculating problems (consumer surplus, producer surplus – tariffs, quotas).

**10<sup>th</sup> week:**

**Lecture:** Monopoly (the profit-maximization condition; average revenue, marginal revenue, total revenue curves).

**Seminar:** Problems (calculation of the profit-maximization output and price. Relationship between the marginal revenue and the linear

demand curve).

**11<sup>th</sup> week:**

**Lecture:** First-degree price discrimination, second-degree price discrimination and third-degree price discrimination. Consumer surplus, producer surplus, deadweight loss.

**Seminar:** Monopoly equilibrium versus perfectly competitive equilibrium.

**12<sup>th</sup> week:**

**Lecture:** Market structure and competition. The main characteristics of oligopoly and monopolistic competition.

**Seminar:** Comparative analyses.

**13<sup>th</sup> week:**

**Lecture:** Time value of money. Present value calculation, net present value, profitability index.

**Seminar:** Analysing of an investment possibility. Net present value calculation.

**14<sup>th</sup> week:**

**Lecture:** Payback period and discounted payback period.

**Seminar:** Analysis of investment possibilities. Annuities.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

## Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practicals 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. A student can't make up a practice with another group. The attendance on practice will be recorded by the practice leader. Being late is equivalent with 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, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his or 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 7th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade: The course ends in a mid-semester grade (AW5). The mid-semester grade is calculated as an average of the test results. The minimum requirement for the mid-term and end-term tests is 50%. Based on the score of the tests separately, the grade for the tests is given

according to the following table: Score Grade 0 - 49 fail (1) 50 - 62 pass (2) 63 - 75 satisfactory (3) 76 - 88 good (4) 89 - 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.

### Required reading materials

1. *BESANKO, DAVID – BREAUTIGAM, RONALD R.: Microeconomics (International Student version)*

3rd. John Wiley and Sons, Inc., 2008.

2. *BESANKO, DAVID – BREAUTIGAM, RONALD R.: Microeconomics Study Guide*

3rd. John Wiley and Sons, Inc., 2008.

*GREGORY MANKIW: Principles of Microeconomics 4th. South-Western College Publishing, 2006.*

Subject: **MANAGEMENT FOR ENGINEERS**

Coordinator: **Andrea Emese Matkó**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Lecture: **1**

Seminar: **3**

**1<sup>st</sup> week:**

**Lecture:** The history of management. A classical school, integrating management theories, emerging management positions

**Seminar:** group work, situational tasks, discussion with different dispute methods

**2<sup>nd</sup> week:**

**Lecture:** Organization structures. Matrix, Functional, Divisional, Line

**Seminar:** SWOT analysis

**3<sup>rd</sup> week:**

**Lecture:** Management gurus Fayol, Taylor, Mitzberg, Porter, Weber, Mayo

**Seminar:** Pest model

**4<sup>th</sup> week:**

**Lecture:** Functions of management, Leadership theories, Planning, Organizing, Directing, Controlling, Innovation and Representation, Trait theory, Behavioural theories, The

Contingencialist Leadership Models, Hersey and Blanchard

**Seminar:** Situational tasks in group work, Tests measuring leadership styles

**5<sup>th</sup> week:**

**Lecture:** Managing people perception, learning

and personality, motivation and organizational learning

**Seminar:** group work, situational tasks, discussion with different dispute methods

**6<sup>th</sup> week:**

**Lecture:** Leadership styles Autocratic, Bureaucratic, Laissez-faire, Democratic, Transformational leadership

**Seminar:** Tests measuring leadership styles, discussion of the results

**7<sup>th</sup> week:**

**Lecture:** Leadership qualities. Most important leadership skills and qualities, Generic leadership traits, What you have to know, What you need to do, How to turn the core leadership functions into skills

**Seminar:** Tests measuring leadership qualities, discussion of the results

**8<sup>th</sup> week:**

**Lecture:** Time management, Energy management Taming Time, A Few Myths About Managing Your Time, Lining Up Your Ducks: Prioritize!, Knowing Your Time Management Style, How You Relate to Time

**Seminar:** Techniques to manage the time and energy



**9<sup>th</sup> week:**

**Lecture:** The basics of strategic management , Problem-solving strategic analysis, strategy formulation, strategy implementation, what is a problem? How can it be solved?

**Seminar:** Why-why analysis, 80/20 theory, fishbone diagram

**10<sup>th</sup> week:**

**Lecture:** Work Performance determining work performance, analyze the problems, find solutions

**Seminar:** Test measuring Work Performance,, discussion of the results

**11<sup>th</sup> week:**

**Lecture:** Emotional Intelligence determining emotional intelligence, highlighting the EM'S role and its effect in the leadership

**Seminar:** Tests measuring the Emotional Intelligence, discussion of the results

**12<sup>th</sup> week:**

**Lecture:** Managing relationships

communications, interpersonal relationships, building groups into teams communications, interpersonal relationships, building groups into teams

**Seminar:** Tests measuring, discussion of the results

**13<sup>th</sup> week:**

**Lecture:** Coaching, stress caused by leadership defining what a coach is, identifying, the tasks of coaching and authoritarian leadership, signs of stress, recognizing symptoms

**Seminar:** Case studies, stress tests

**14<sup>th</sup> week:**

**Lecture:** The basic of Quality Management. ISO 9001:2008, TOM, EFQM

**Seminar:** Case studies.

**15<sup>th</sup> week:**

**Lecture:** End-term test

## Requirements

Topics: In the Management for Engineers course students gain in sight into the key areas of leadership. During the course students become familiar with the new management trends, such as coaching authoritarian leadership, time- and energy management and with the importance of emotional intelligence in effective leadership. In the framework of practical classes the students' leadership skills, emotional intelligence and their soft skills are measured and analyzed.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals 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. Attendance at practicals will be recorded by the practice leader. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class. During the semester there is an end-term test in the 15th week. Students have to sit for the test.

B, for a grade: The course ends in a mid-semester grade (AW5) based on the average of the grades of the participation and the average of the test results, the mid-semester grade is calculated as an average of them: - the average grade of practice - the average grade of the test 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 table: 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, once students can take a retake test of the whole semester material.

### Required reading materials

*McKeown, A. – Wright, R. : Professional English in Use*

Cambridge University Press, 2011.

*Schwartz, T – Loehr, J. : The Power of Full Engagement: Managing Energy, Not Time, Is the Key to High Performance and Personal Renewal*

Free Press, 2005.

*McKeown, A. – Wright, R. : Leader Effectiveness Training*

Cambridge University Press, 2011.

*Mancini, M. : Time management*

McGraw-Hill Companies, 2003.

*Taylor, J. : Decision Management System*

IBM Press, 2012.

Subject: **BASICS OF QUALITY MANAGEMENT**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **1**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Quality and global competitiveness

**Seminar:** Discussion with different dispute methods, case studies.

**2<sup>nd</sup> week:**

**Lecture:** Strategic management: planning and execution

**Seminar:** Discussions with different dispute methods, case studies.

**3<sup>rd</sup> week:**

**Lecture:** Quality management and ethics, and communication and interpersonal relations.

**Seminar:** Case studies, situational tasks.

**4<sup>th</sup> week:**

**Lecture:** Total quality management.

**Seminar:** Discussions with different dispute methods, case studies.

**5<sup>th</sup> week:**

**Lecture:** Quality improvement techniques.

**Seminar:** Case studies, group work, situational tasks.

**6<sup>th</sup> week:**

**Lecture:** Statistical concepts

**Seminar:** Discussion with different dispute methods, case studies.

**7<sup>th</sup> week:**

**Lecture:** Control charts for variables, control chart interpretations and analyses, other variable control charts.

**Seminar:** Case studies, group work.

**8<sup>th</sup> week:**

**Lecture:** Control charts for variables, control chart interpretations and analyses, other variable control charts.

**Seminar:** Case studies, group work.

**9<sup>th</sup> week:**

**Lecture:** Fundamentals of probability. Reliability.

**Seminar:** Discussion with different dispute methods, case studies.

**10<sup>th</sup> week:**

**Lecture:** Quality costs

**Seminar:** Discussion with different dispute methods, case studies.

**11<sup>th</sup> week:**

**Lecture:** Quality function deployment. Design of experiments

**Seminar:** Case studies, group work.

**12<sup>th</sup> week:**

**Lecture:** Quality systems: ISO 9000

**Seminar:** Case studies, group work.

**13<sup>th</sup> week:**

**Lecture:** Quality systems: ISO 9000

**Seminar:** Case studies, group work.

**14<sup>th</sup> week:**

**Lecture:** Six Sigma

**Seminar:** Case studies, group work.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

Topics: This course focuses on making the theories and principles of total quality both practical and useful ways. Practitioners in a corporate setting will find it a valuable guide in helping them to learn how to be effective agents of the total quality approach, to understand and implement total quality.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 practicals will be recorded by the practice leader. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class. During the semester there is an end-term test in the 15th week. Students have to sit for the test.

B, for a grade: The course ends in a mid-semester grade (AW5) based on the average of the grades for the participation and the average of the test results, the mid-semester grade is calculated as an average of them: - an average grade of the practice - a grade of the test The minimum requirement for the mid-term and end-term tests is 60%. Based on the score of the test, the grade for the test 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) If the score of the test is below 60, once the student can take a retake test of the whole semester material.

### Required reading materials

*Goetsch D. L. – Davis, S: Quality management: introduction to total quality management for production*

Pearson Prentice Hall, 2006. ISBN: 0131189298, 97801311

*Dale, B. G. : Managing Quality Wiley-Blackwell, 2003. ISBN: 0631236147, 97806312*

Subject: **INTRODUCTION TO ETHICS**

Coordinator: **Zsolt Tiba**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** The code of engineering ethics. Rights to engineering services.

**2<sup>nd</sup> week:**

**Lecture:** An engineer's obligations to society. Obligations to his/her profession, employers and clients.

**3<sup>rd</sup> week:**

**Lecture:** Roles of engineering societies in ethics.

**4<sup>th</sup> week:**

**Lecture:** Ethical behavior versus management. Internal and external procedures for considering dissenting views.

**5<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**6<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**7<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**8<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**9<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**10<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing

the case studies in terms of engineering ethics.

**11<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**12<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**13<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**14<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

**15<sup>th</sup> week:**

**Lecture:** Case studies. Discussing and analyzing the case studies in terms of engineering ethics.

### Requirements

Topics: This course is intended to introduce students to the study of ethics, the branch of philosophy that aims to understand what actions are right and wrong, what states of affairs are good and bad, and what traits of personality are desirable and undesirable. Our central question will be “What should I (morally) do?” Similarly, although it is impossible to separate the discussion of ethical theories from their application to particular moral problems, this course will emphasize the former. The most well-developed and carefully formulated ethical theory that addresses our central question is utilitarianism: what I should do to make the world a better place. In the second half of we review of the growth and development of professions, engineering ethics, obligations to employers and their peers, limits of professional responsibility, codes of ethics and enforcement. Traditional function of engineering societies. Ethical engineers and the lows, the public interest analyzing some case studies.

A, for a signature: Participation at lectures is compulsory. Students must attend the lecture and may not miss more than three practice during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up a lecture with another group. Attendance at lecture will be recorded by the lecturer. Being late is equivalent with 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, being discussed with the tutor. Active participation is evaluated by the lecture in every lecture. If a student's behavior or conduct doesn't meet the requirements of active participation, the lecturer may evaluate his/her participation as an absence because of the lack of active participation in class. Each student must give one short presentation about a case study during the semester. The presenter has to show his or her ability to present the case study clearly, focuses on the most important parts in a concise manner and answers the questions raised by the audience or the lecturer. Student has to analyze his or her case study in terms of ethical behavior, obligation to the profession, to the society, to the employer and the client.

B, for a grade: The course ends in an examination (ESE). Based on the grades of the presentation

and the examination, the exam grade is calculated as an average of them: The minimum requirement for the examination is 60%. Based on the score of the tests separately, the grade for the tests and the examination 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) If the score of any tests is below 60, the student can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS. An offered grade: it may be offered for students if the grade of the presentation is at least satisfactory (3).

### **Required reading materials**

*Charles E. Harris, Michael S. Pritchard, Michael J. Rabins: Engineering Ethics: Concepts and Cases 2008.*

#### **EUROPEAN STUDIES**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

### **Requirements**

A, for a signature: Attendance at lectures is recommended, but not compulsory.  
B, for a grade: The course ends in a mid-semester grade (AW5). Based on the average of the marks of the mid-term and the end-term results, the mid-semester grade is calculated as an average of them: - the average grade of the two tests (50-50%) 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 table: 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.

### **Required reading materials**

*Ali El-Agraa: The European Union: Economics and Policies*

Cambridge University Press, 2007.

*Federiga Bindi: The Foreign Policy of the European Union: Assessing Europe's Role in the World*

Brookings Institution Press, 2010.

*Martin Sajdik, Michael Schwarzingler: European Union Enlargement: Background, Developments, Facts*

Transaction Publishers, 2011.

## **Civil Engineering Compulsory Subjects**

Subject: **GEOINFORMATICS I**

Coordinator: **János Bíró**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Geoids, reference of ellipsoid and the earth's gravity field. Elementary geometry of the ellipsoid.

**Practical:** Adding angles.

**2<sup>nd</sup> week:**

**Lecture:** Determination of geodetic position in terms of geographical coordinates. Geodetic datum concepts and geodetic surveying.

**Practical:** Transferring whole circle bearing

**3<sup>rd</sup> week:**

**Lecture:** Map projections, conformal projection. Coordinate systems in the plane. Geodetic Control Networks.

**Practical:** Measuring slope distances. Calculations of distance.

**4<sup>th</sup> week:**

**Lecture:** Measuring angles. The Horizontal Reading. The Zenith Angle. The theodolite. Geodetic telescopes.

**Practical:** Levelling an instrument, Setting up a theodolite.

**5<sup>th</sup> week:**

**Lecture:** Methods of circle reading, A graduated microscope and the coincidence method. Horizontal and vertical circles.

**Practical:** Practicing of circle reading.

**6<sup>th</sup> week:**

**Lecture:** Systematic errors of angle measurements.

**Practical:** Compute an orientation angle. Computing WCB.

**7<sup>th</sup> week:**

**Lecture:** The 1<sup>st</sup> fundamental task of surveying. The 2<sup>nd</sup> fundamental task of surveying

**Practical:** The 1<sup>st</sup> fundamental task of surveying. The 2<sup>nd</sup> fundamental task of surveying. (Computing coordinates)

**8<sup>th</sup> week:**

**Lecture:** Mid-term theoretical test Orientation. An orientational angle.

**Practical:** The 1<sup>st</sup> qualifier practice.

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Distance measurements. Principles of Traversing.

**Practical:** Computing mean orientation angle.

**10<sup>th</sup> week:**

**Lecture:** Types of traverse lines. Free traverse. Inserted traverse. Closed line traverse.

**Practical:** Computing orientation with circle reading.

**11<sup>th</sup> week:**

**Lecture:** Localizing blunders in observations. Distance observations. Angular observations.

**Practical:** Computation of a closed line traverse.

**12<sup>th</sup> week:**

**Lecture:** Principle of tacheometry. Horizontal coordinates. Vertical coordinates. Detail surveys using tacheometry.

**Practical:** Computation of the inserted traverse. Computing the corrected coordinate differences.

**13<sup>th</sup> week:**

**Lecture:** Setting out straight lines, angles, points in given elevation, center line of roadworks and curves.

**Practical:** Setting out points with geometric criteria with theodolite and telemeter.

**14<sup>th</sup> week:**

**Lecture:** Electronic tacheometers (Total Stations). Operation of Total Stations. Important software of Total Stations.

**Practical:** Using Total Stations.

**15<sup>th</sup> week:**

**Lecture:** End-term theoretical test

**Practical:** 2<sup>nd</sup> qualifier practice

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 practicals will be recorded by the practice leader. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests. During the semester there are two qualifier practice tasks: the first one in the 8th week and the second one in the 15th week. Students have to complete all the two qualifier tasks as scheduled minimum at a sufficient level.

B, for a grade: The course ends in a mid-semester grade (AW5). Based on the average of the marks of the qualifier practice tasks and the average of the test results, the mid-semester grade is calculated as an average of them:  $((\text{No. 1 practical test result} + \text{No. 2 practical test result})/2 + \text{Mid-term theoretical test result} + \text{End-term theoretical test result})/3$ .

### Required reading materials

*Wolfgang Torge, Jürgen Müller : Geodesy*

2012. ISBN: 978-3-11-025000-8

*Wolfgang Torge : Geodesy*

2001. ISBN: 3-11-017072-08

*James A. Elithorp, Jr. and Dennis D. Findorff: Geodesy for Geomatics and GIS Professionals*  
2nd.

Subject: **GEOINFORMATICS II**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Mapping the survey. Digital mapping.

Analog and digital data sources. Attributes.

Introducing Digicart's ITR5.

**Practical:** Digital mapping with ITR5.

**2<sup>nd</sup> week:**

**Lecture:** Fundamentals of photogrammetry.

Analog and digital photogrammetry.

Orthophotography.

**Practical:** Digital mapping with ITR5.

**3<sup>rd</sup> week:**

**Lecture:** Fundamentals of topography.

Topographical databases.

**Practical:** Topographical practice. Drawing contour-map.

**4<sup>th</sup> week:**

**Lecture:** Intersections. Foresection with inner

angles. Foresection with WCBs. Different types of intersections.

**Practical:** Digital mapping with ITR5.

**5<sup>th</sup> week:**

**Lecture:** Resection. Resection – the dangerous circle. Arc section.

**Practical:** Digital mapping with ITR5.

**6<sup>th</sup> week:**

**Lecture:** Types of errors. Basics of error theory. Systematic errors. Random errors. The aim of processing the observations. Error propagation.

**Practical:** Digital mapping with ITR5.

**7<sup>th</sup> week:**

**Lecture:** Adjusting the observations of a single quantity. The 'a priori' and the 'a posteriori' mean errors. The process of adjustment. When the 'a priori' mean error of observations is equal.

**Practical:** Digital mapping with ITR5.

**8<sup>th</sup> week:**

**Lecture:** Mid-term theoretical test. Land

management. Land registry. Organizations of the Hungarian land surveying. FÖMI.

**Practical:** No.1 qualifier practice

**9<sup>th</sup> week:**

**Lecture:** The principle of trigonometric heighting. Trigonometric levelling. The determination of the heights of buildings.

**Practical:** Trigonometric heightening.

**10<sup>th</sup> week:**

**Lecture:** Structure of levels. The principle of levelling. The Surveyor's level. Elements of surveyor's level.

**Practical:** Line levelling with surveyor's optical level.

**11<sup>th</sup> week:**

**Lecture:** Adjusting the level. Systematic error in levelling. Procedure of levelling. Line levelling. Processing levelling data

**Practical:** Line levelling with surveyor's digital level.

**12<sup>th</sup> week:**

**Lecture:** The 'a priori' mean error of levelling. Computation of heightening lines and joints.

**Practical:** Computation of heightening lines (levelling)

**13<sup>th</sup> week:**

**Lecture:** Global Navigation Satellite Systems. History of GPS. GPS Satellite Concept. GPS System Segments. Principle of Positioning. GPS codes and the determination of travel time. Accuracies / Error sources.

**Practical:** Line levelling – two-way (the rise and fall method)

**14<sup>th</sup> week:**

**Lecture:** Application of GNSS in Surveying. Absolute vs. Relative positioning. The GNSS infrastructure and its evolution. Transformation of WGS-84 coordinates to the national coordinate system.

**Practical:** GNSS measuring - Real-time kinematic observations

**15<sup>th</sup> week:**

**Lecture:** End-term theoretical test<sup>2<sup>nd</sup></sup> qualifier practice

**Self Control Test**

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals and may not miss more than three times 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 practicals will be recorded by the practice leader. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests. During the semester there are two qualifier practice tasks: the first qualifier practice in the 8th week and the second qualifier practice in the 15th week. Students have to complete all the two qualifier practice tasks as scheduled minimum on a sufficient level.

B, for a grade: The course ends in an exam (ESE). Based on the average of the marks of the qualifier practice tasks and the average of the test results, the mid-semester grade is calculated as an average of them:  $((1\text{st practical test result} + 2\text{nd practical test result})/2 + \text{Mid-term theoretical test result} + \text{End-term theoretical test result})/3$ . 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 table: 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.



## Required reading materials

*James A. Elithorp, Jr. and Dennis D. Findorff: Geodesy for Geomatics and GIS Professionals*  
2nd.

*Wolfgang Torge : Geodesy*

2001. ISBN: 3-11-017072-08

*Wolfgang Torge, Jürgen Müller : Geodesy*

2012. ISBN: 978-3-11-025000-8

Subject: **GEOGRAPHICAL INFORMATION SYSTEM (GIS) I**

Coordinator: **János Bíró**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **1**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction to GIS: Definitions and Characteristics of GIS.

**Practical:** Generic Computer and IT skills.

**2<sup>nd</sup> week:**

**Lecture:** Datums, Projections and Geocoding. Fundamentals of spatial functionality.

**Seminar:** Using a customized database systems to extract interaction data.

**3<sup>rd</sup> week:**

**Lecture:** Hardware and software components of GIS. An introduction to desktop GIS packages.

**Seminar:** Multi-criteria evaluation techniques.

**4<sup>th</sup> week:**

**Lecture:** Databases. Spatial Database Concepts.

**Practical:** Accessing data from various online providers (e.g. FÖMI).

**5<sup>th</sup> week:**

**Lecture:** Data input. Data models and structures.

**Practical:** Using web-based systems to extract various geographic and attribute data for use in Open JUMP.

**6<sup>th</sup> week:**

**Lecture:** Spatial Data Models: The Digital Representation of Spatial Data.

**Practical:** Basic introduction to Open JUMP customization.

**7<sup>th</sup> week:**

**Lecture:** Spatial Analytical Functionality in GIS.

**Practical:** Identify, retrieve, sort and exchange geographical information using OpenJUMP.

**8<sup>th</sup> week:**

**Lecture:** Mid-term theoretical test. Spatial Data Quality, Accuracy, Errors and Standards.

**Practical:** Use of Spatial Analyst for raster data manipulation.

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Spatial Interpolation and Surface Analysis.

**Practical:** Use of Open JUMP for various analyses (spatial selection, spatial query).

**10<sup>th</sup> week:**

**Lecture:** Network Analysis - Route Finding through networks.

**Practical:** Use of OpenJUMP for various analyses (buffering, overlay, aggregation).

**11<sup>th</sup> week:**

**Lecture:** GIS and Spatial Modelling.

**Practical:** Using Open JUMP for various analyses and for production of cartographic, chart and tabular output.

**12<sup>th</sup> week:**

**Lecture:** Data sharing and Legal Issues.

**Practical:** Use of Open JUMP for editing and displaying cartographic data.

**13<sup>th</sup> week:**

**Lecture:** Use of key analysis features.

**Practical:** Filling attribute tables with other relevant informations.

**14<sup>th</sup> week:**

**Lecture:** Cartographic output. Conclusions.

**Practical:** Use of Open JUMP for production of cartographic output.

**15<sup>th</sup> week:**

**Lecture:** End-term theoretical test

**Self Control Test**

**Requirements**

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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. Missed practices should be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for grade: The course ends in mid-semester grade (AW5). Based on the average of the test results, the mid-semester grade is calculated as an average of them: - the 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 table: 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.

**Required reading materials**

*CHRISTOPHER B. JONES : Geographical information systems and computer cartography*  
1997. ISBN: 0582044391

*PAUL A. LONGLEY : Geographical information systems and science*  
2005. ISBN: 047087001X

Subject: **HYDRAULICS I**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Hydrostatics. Physical properties of water and various fluids. An ideal fluid. Fluid viscosity. Pressure conditions of fluids in absolute or relative static-state. Pressure, pressure distribution, hydrostatic force. Euler-equation of hydrostatics.

**Practical:** Density, specific weight. Elastic compressibility. Thermal volume expansion. Capillarity- Role of adhesive and cohesive forces as well as surface tension. The governing

equation in gravity field. Pascal's law. Hydrostatic pressure head.

**2<sup>nd</sup> week:**

**Lecture:** Hydrostatics. Absolute and relative equilibrium. Pressure (head) distribution and resultant pressure forces on various impervious rigid surfaces. The governing equation in the Earth gravity field. The governing equation of hydrostatics in relative equilibrium in accelerating systems.

**Practical:** Hydrostatic pressure distribution and pressure forces on horizontal plane surfaces. Pressure distribution and pressure forces on vertical impervious plane surfaces with constant width. Pressure distribution and pressure forces on inclined impervious plane surfaces.

**3<sup>rd</sup> week:**

**Lecture:** Determination of a pressure centre. Pressure head distribution and pressure force on prismatic surfaces. Pressure head distribution and pressure force on cylinder shape surfaces. Pressure head distribution and pressure force on surfaces with arbitrary shapes.

**Practical:** Decomposition to horizontal and vertical components. Pressure distribution and pressure forces on plane surfaces with arbitrary shapes and inclination. Pressure head distribution and pressure force on prismatic surfaces.

**4<sup>th</sup> week:**

**Lecture:** Flow velocity. Laminar and turbulent motion. Laminar flow in a tube. Typical states of motion. The Reynolds-number. Subcritical, critical and supercritical flows. Hydraulic jump. The Froude-number. Classification of steady-state flows upon the rate of spatial variation. Classification of unsteady flows upon the rate of space-time variation

**Practical:** Examples on the role of turbulence. Some more facts on the role of turbulence. Some more evidence on the presence of turbulence in the ecosystem.

**5<sup>th</sup> week:**

**Lecture:** Fluid dynamics. Euler equation for ideal fluid in hydrodynamic conditions. Application of the Bernoulli equation on the entire cross-section of a flow.

**Practical:** Steady-state dynamic equilibrium of ideal fluids in gravity field: the Bernoulli equation. Dynamic equilibrium in case of an elementary stream-tube. The Bernoulli-equation on real (viscous) fluids.

**6<sup>th</sup> week:**

**Lecture:** Application of the Bernoulli-equation. Bernoulli equation for real (viscous) fluids. Head losses.

**Practical:** Issuing from a tank through a small orifice. Velocity-, contraction- and discharge coefficients.

**7<sup>th</sup> week:**

**Lecture:** Fluid dynamics. Velocity and shear stress distribution in steady-state pipe flows. Head losses.

**Practical:** Velocity distribution and head losses in steady-state pipe flows. Radial distribution of the shear stress.

**8<sup>th</sup> week:**

**Lecture:** Laminar velocity distribution and head loss. Radial distribution of the velocity in laminar flows. Friction loss in long pipes. The Moody-diagram.

**Practical:** Head losses in laminar flows. Velocity distribution in terms of the Re number. Velocity distribution and head losses in turbulent pipe flows.

**9<sup>th</sup> week:**

**Lecture:** Outflow (issuing) through a large orifice. The Bazin-weir. Circular weirs. The Poncelet-weir.

**Practical:** Issuing through a large orifice. Overtopping with a backwater effect. Overtopping and outflow examples from River Tisza, 2001.

**10<sup>th</sup> week:**

**Lecture:** The Thomson-weir, The Cipoletti-weir.

**Practical:** Weirs developed by nature.

**11<sup>th</sup> week:**

**Lecture:** Chézy-formula, Chézy velocity coefficient and its estimation, Bed roughness and smoothness.

**Practical:** Hydraulic sizing of free surface channels. Regular trapezoidal channel cross-section.

**12<sup>th</sup> week:**

**Lecture:** Sizing of open channels, Critical (threshold) velocities, international methods to solve the formula on water depth.

**Practical:** Application of the fix point iteration on the Chézy formula. Calculating free surface

gradually varying flows in channels.

**13<sup>th</sup> week:**

**Lecture:** Subcritical, critical and supercritical flows. Flow depth - specific energy curve (Braun-curve). Flow depth - specific discharge curve (Koch-curve). Suddenly varying flow: the hydraulic jump.

**Practical:** Subcritical and supercritical flow. Specific discharge at constant energy head: Koch-curve. Free hydraulic jump and its corresponding depths. Shortening the length of the reach to be protected by a stilling basin.

**14<sup>th</sup> week:**

**Lecture:** The Darcy-law and its validity. An analysis of groundwater and deeper aquifer abstraction wells.

**Practical:** Example to a simplified problem solution: Capacity of groundwater wells.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. A student must attend the practicals and may not miss more than three times during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. A student can't make up a practice with another group. Attendance at practicals will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If students' behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence because of the lack of active participation in class. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a 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 table: 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 of the whole semester material.

### Required reading materials

CHADWICK A., MORFETT J., BORTHWICK M.: *Hydraulics in civil and environmental engineering*

Spoon Press, 2004.

GERHART P. M.: *Fundamentals of fluid mechanics*

Addison Wesley, 1992.

MUNSON B. R., YOUNG D. F., OKIISHI T. H.: *Fundamentals of Fluid Mechanics*

John Wiley and Sons, 2009. ISBN: 978-0470262849

ROBERTSON J.A.: *Engineering fluid mechanics*

Houghton Mifflin, 1985.

WEBBER N.B.: *Fluid mechanics for civil engineers*

Chapman and Hall, 1985.

Subject: **HYDROLOGY AND HYDROGEOLOGY I**

Coordinator: **Beáta Pataki**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction to hydrology and hydrogeology: the focus of hydrology. Sub-disciplines and interdisciplinary areas of hydrology. The role of hydrology in society and economy.

**Seminar:** issuing task 1: Short (10-15 pages long) paper and ppt presentation on a given topic

**2<sup>nd</sup> week:**

**Lecture:** Physical forms of water. Hydrologic cycle and water budget. Water balance equation. The effect of climate changing on the elements of hydrological cycle.

**Seminar:** consultation of task 1

**3<sup>rd</sup> week:**

**Lecture:** Precipitation: forms and types of precipitation. Theories of precipitation formation. Quantity variables – in time and space. Rain characteristics. Measurement of precipitation (different types of data). Analyses of data. The rule of Montanari. Areal averages of precipitation.

**Seminar:** issuing task 2: Calculation of precipitation extrema. (Montanari method)

**4<sup>th</sup> week:**

**Lecture:** Evaporation: the physics of evaporation. Evaporation of open water surface, soil and vegetation – evaporation, transpiration and evapotranspiration Measurement and estimation of evaporation.

**Seminar:** issuing task 3: calculation of evaporation

**5<sup>th</sup> week:**

**Lecture:** Infiltration: process and characteristics. The infiltration curve. Measurement of infiltration. Water forms in the soil. Hydrogeology and groundwater.

**Seminar:** submitting task 2, consultation: paper and ppt presentation on the selected topic

**6<sup>th</sup> week:**

**Lecture:** Classification of sediments and groundwater types. Characterization of groundwater regimes. Physical, chemical and bacteriological properties of ground water. Unconfined, confined, artesian and karstic ground water. Springs and wells.

**Seminar:** submitting task 1: students' ppt presentations

**7<sup>th</sup> week:**

**Lecture:** The runoff process. The importance watershed. Estimation of watershed characteristics. Time of concentration, the runoff ratio. Methods of effective precipitation estimation in terms. A unit hydrograph and its estimation by a classical method: the S-curve technique.

**Seminar:** submitting task 3, issuing task 4: Watershed delineation. Construction of runoff maps.

**8<sup>th</sup> week:**

**Lecture:** Types of surface water. Hydrology of streams (potamology). Cross- and longitudinal sections of streams and their valleys. Stream characterization. Types and characteristics of lakes.

**Seminar:** Performing double transformations for rainfall-runoff calculations. A classical method of unit hydrograph estimation.

**9<sup>th</sup> week:**

**Lecture:** Water-level and discharge: measurement of a stage and discharge, hydrometric databases. Characteristics of stages. Basics of hydrography. Data analyses.

**Seminar:** issuing task 1: ppt presentation of students

**10<sup>th</sup> week:**

**Lecture:** Relation between water-level and

discharge – QH curve. The method of moments in the calculation of a unit hydrograph. An instantaneous unit hydrograph.

**Seminar:** Rating curve transformation with the help of equivalent stages. Factors influencing the a rating curve.

**11<sup>th</sup> week:**

**Lecture:** Streamflow regimes. Frequency and duration. Permanent and non-permanent rating curves.

**Seminar:** Issuing task 5: calculation frequency and duration curves of stages

**12<sup>th</sup> week:**

**Lecture:** Extrapolation of a rating curve. Flood routing. Flash floods. Flood defense.

**Seminar:** submitting task 5, Consultation

**13<sup>th</sup> week:**

**Lecture:** Sediment and ice regimes of rivers. Types of sediment and ice. Measurement, data analyses.

**Seminar:** Visiting a hydrological measurement station

**14<sup>th</sup> week:**

**Lecture:** Hydrology in water management and civil engineering practice. Modeling of hydrological elements.

**Seminar:** Visiting a hydrological measurement station

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

## Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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. The practice leader records attendance. 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, being discussed with the tutor. Students are required to bring calculators to each practice class. The activity of participation is evaluated by the teacher. If student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence because of the lack of active participation in class. Students have to submit all the five calculation tasks as scheduled minimum at a sufficient level.

During the semester there is one test: the end-term test in the 15th week. The minimum requirement for the end-term test is 60%. If the score of the test is below 60, the student once can take a retake test covering the whole semester material: Score Grade 0-59 fail (1) 60-69 pass (2) 70-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5) B, for a grade: The course ends in a terminal examination, which includes a written and an oral exam (ESE).

## Required reading materials

*Martin R. Hendriks : Introduction to Physical Hydrology*

Oxford Press, 2010. ISBN: 978-0-19-929684-2

*Roy Ward and Mark Robinson : Principles of Hydrology*

4th. McGraw-Hill International , 2000. ISBN: 0 07 709502 2

*Philip B. Bedient, Wayne C. Huber and Baxter E. Vieux : Hydrology and Floodplain Analysis*

5th.2012. ISBN: 978-0132567961

*Lecture notes of the International Post-Graduate Course on Hydrology*

a copy available at Bea Pataki. UNESCO-VITUKI,

Subject: **BASICS OF ENVIRONMENTAL ENGINEERING**

Coordinator: **Ildikó Bodnár**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **1**

### **Requirements**

Topics: The main goals of the course are: to help understanding the complexity of environmental problems, shaping attitude and broadening knowledge of the new generation of civil engineers to be able to use the system approach in technical planning and for solving comprehensive environmental management, regulation and planning tasks. The course helps to understand the effects of the engineering activities on the environment.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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. The practice leader records the attendance. Being late is equivalent with 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, being discussed with the tutor. Students are required to bring calculator to each practice. The activity of participation is evaluated by the teacher. If student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence due to the lack of active participation in class. Students have to submit all the five tasks as scheduled minimum at a sufficient level. During the semester there is one test at the end-term test in the 15th week. The minimum requirement for the end-term test is 60%. If the score of the test is below 60, the student once can take a retake test covering the whole semester material: Score Grade 0-59 fail (1) 60-69 pass (2) 70-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5)

B, for a grade: The course ends in mid-semester grade (AW5), which includes a written test.

### **Required reading materials**

*D. Heinrich and H. Manfred : Atlas of Ecology*

Springer Verlag, 1994.

*M.E. Jensen and P.S. Bourgeron : A Guidebook for Integrated Ecological Assessments*

Springer Verlag , 2001. ISBN: 9780387985831

*Guy R. McPherson, Stephen DeStefano : Applied Ecology and Natural Resource Management*

Cambridge University Press, 2002.

*W. Barthlott and M. Winiger : Biodiversity - A Challenge for Development Research and Policy*

Springer, 2001. ISBN: 9783540639497

*W. Steffen, J. Jäger, D.J. Carson, C. Bradshaw: Challenges of a Changing Earth*

Springer, 2003. ISBN: ISBN 9783540433088

*Bruce Wiersma : Environmental monitoring*

CRC Press, 2004. ISBN: 9781566706414

Subject: **PUBLIC WORKS I**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** The main features of public works.

**Practical:** issuing the task 1: Designing pressure water systems and sewer systems.

**2<sup>nd</sup> week:**

**Lecture:** Groups of water resources. Water consumption.

**Practical:** Drawing a general plan. Consultation.

**3<sup>rd</sup> week:**

**Lecture:** Water quality and classification, water treatment-purification process.

**Practical:** A longitudinal section. Consultation.

**4<sup>th</sup> week:**

**Lecture:** Designing (dimension) a pressure water system.

**Practical:** Practicing the presentation methods. Calculate a water demand rate.

**5<sup>th</sup> week:**

**Lecture:** Modelling of a water system.

**Practical:** Applied dimensional methods to dimension parts. Usual materials of piping. Consultation.

**6<sup>th</sup> week:**

**Lecture:** General prescriptions for dimensioning. Kirchhoff's first and second law.

**Practical:** Calculate water demand for fire-fighting. A longitudinal profile. The protection distance/area.

**7<sup>th</sup> week:**

**Lecture:** Grouping sewer systems. Combined sewer systems and separated sewer systems.

**Practical:** submitting task 1, issuing task 2 :

designing sewer systems.

**8<sup>th</sup> week:**

**Lecture:** Mid-term test

**Practical:** Designing, consultation.

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Pressure sewer systems, vacuum sewer systems.

**Practical:** Applied dimensional methods to dimension parts. Usual materials of piping. Consultation.

**10<sup>th</sup> week:**

**Lecture:** Dimensional methods of a waste water pipe.

**Practical:** Applied dimensioning methods to dimension parts. Consultation.

**11<sup>th</sup> week:**

**Lecture:** Dimension methods of a storm water pipe.

**Practical:** License-free dimensioning programs.

**13<sup>th</sup> week:**

**Lecture:** Building of a water supply system, a sewer system.

**Practical:** Visiting of practice places.

**14<sup>th</sup> week:**

**Lecture:** Repetition of main relationships in public works.

**Practical:** Preparing for the end-term test.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

Topics: The series of lectures are based on the relevant standards. This course presents basic technical parameters of water public works, water consumption and its features. Water resources in Hungary( in Europe). Water quality and water classification. Physical, chemical and biological parameters. Water supply systems. Water distribution systems, networks. Types of sewers.



Estimating wastewater flow. Sewers design. Storm water inlets. Manholes. The basic designing instructions are presented for public utilities (pressure water systems, sewer systems).

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 any practice class with another group. Attendance at practice will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring calculators to each practice class. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class. Students have to submit all the two drawing 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. Students have to sit for the tests.

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 two drawing tasks - the 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 grades for the tests 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) If the score of any test is below 60, the student once can take a retake test of the whole semester material.

### Required reading materials

*Jonathan T. Ricketts, M. Kent Loftin, Frederick S. Merritt: Standard Handbook for Civil Engineers*  
Section 19. Rail-Transportatio. McGraw-Hill Publishing Company, 2003. ISBN: 0-07-136473-0  
*Melvyn Kay: Practical Hydraulics*  
Taylor and Francis Group, 2008. ISBN: 978-0-415-35115-7

Subject: **WATER MANAGEMENT AND HYDRAULIC STRUCTURES**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** the aim of water management; the impacts of climate change on water management

**Seminar:** river basin planning according to Directive 2000/60/EC

**2<sup>nd</sup> week:**

**Lecture:** the relation between water management and hydraulic structures

**Seminar:** issuing task 1: study of one specific river basin management plan from given aspects

**3<sup>rd</sup> week:**

**Lecture:** the aim and technical measures of

harnessing and using water resources

**Seminar:** examples for technical measures of harnessing and using water resources

**4<sup>th</sup> week:**

**Lecture:** the aim and technical measures of the prevention of negative water related events in plain areas

**Seminar:** examples for technical measures of prevention of floods and excess water in plain areas; issuing the task 2: open channel design

**5<sup>th</sup> week:**

**Lecture:** the aim and technical measures of

irrigation

**Seminar:** examples for water saving technical measures of irrigation; issuing the task 3: culvert design

**6<sup>th</sup> week:**

**Lecture:** the aim and technical measures for the prevention of negative water related events in hilly areas

**Seminar:** examples for technical measures for erosion and flood control in hilly areas; issuing task 4: designing a check dam

**7<sup>th</sup> week:**

**Lecture:** urban water management issues

**Seminar:** examples for special cases like thermal water management, sewerage of small settlements, stormwater management, etc.

**8<sup>th</sup> week:**

**Lecture:** submitting tasks 1,2,3,4

**Seminar:** examples for environmental impacts of existing water management measures

**9<sup>th</sup> week:**

**Lecture:** classification of hydraulic structures by purpose and types

**Seminar:** examples for purposes and types of hydraulic structures

**10<sup>th</sup> week:**

**Lecture:** storage structures and dams; types of

reservoirs

**Seminar:** functional elements of water reservoirs

**11<sup>th</sup> week:**

**Lecture:** types of dams (structure, material, purpose, advantages, disadvantages)

**Seminar:** examples for different types of dams

**12<sup>th</sup> week:**

**Lecture:** factors for selection of site of dam

**Seminar:** examples for site selection

**13<sup>th</sup> week:**

**Lecture:** energy dissipaters; sedimentation behind the dam; losses

**Seminar:** examples for sedimentation behind dams and technical measures to avoid sedimentation

**14<sup>th</sup> week:**

**Lecture:** End-term test; technical measures of artificial recharge of groundwater

**Seminar:** examples for technical measures of artificial recharge of groundwater

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** possibility for the improvement of End-term test result

## Requirements

Topics: 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 a lot of purposes for which water resources are put to use. Also case studies from Hungary's complex 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. However, several issues like water utilities, water treatment and water resources management are discussed in the frame of other courses; they get less emphasis during this course. Main topics are Classification of hydraulic structures by purpose and types; Site selection factors; design of gravity dams; classification of reservoirs;

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practice is compulsory. Students must attend the practicals and may not miss more than three times during the semester. Students have to submit all the four tasks in time at a sufficient level. During the semester there is one test in the 14th week. Students have to sit for the test. If the score of the

test is below 60, the student once can take a retake test covering the whole semester material. B, for a grade: The course ends in a mid-semester grade (AW5). It is based on the test results. The minimum requirement of the end-term test is 61% it is needed to have a mid-semester grade. Based on the score of the test, the mid-semester grade is given according to the following table: Score Grade 0-60 fail (1) 61-70 pass (2) 71-80 satisfactory (3) 81-90 good (4) 91-100 excellent (5)

### Required reading materials

*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*  
2000.

*ICPDR: A PRACTICAL GUIDE TO INTEGRATED LAND MANAGEMENT METHODS INTENDED TO IMPROVE LAND USE AND WATER MANAGEMENT EFFICIENCY IN THE TISZA RIVER BASIN*  
2010.

*Larry W. Map: Hydraulic design handbook*  
McGraw-Hill Education, ISBN: 0-07-041152-2

Subject: **CONSTRUCTION MATERIALS I**

Coordinator: **Kinga Nehme**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Basic definitions. History of material constructions. Development of material constructions. Grouping of material constructions.

**Seminar:** Weight, density of solid and liquid types of material. Discussing the homework topics.

**2<sup>nd</sup> week:**

**Lecture:** Rheology of material types. Idealisation diagrams.

**Seminar:** Hydrotechnical properties.

**3<sup>rd</sup> week:**

**Lecture:** Aggregates. The Sieve curve

**Seminar:** Aggregates. Design of the Sieve curve.

**4<sup>th</sup> week:**

**Lecture:** Inorganic binder material types.

**Seminar:** Curing of binder material types.

**5<sup>th</sup> week:**

**Lecture:** Lecture: Modifiers. Concrete mix-

design. Properties of fresh concrete.

**Seminar:** Consistency of fresh concrete

**6<sup>th</sup> week:**

**Lecture:** Hardened concrete properties, Durability of concrete.

**Seminar:** Determination of compressive strength of concrete with laboratory measurements with classification.

**7<sup>th</sup> week:**

**Lecture:** ISO Special concrete types (FRC, SCC, HSC etc.)

**Seminar:** bending tests, FRC, SCC, recycled aggregates

**8<sup>th</sup> week:**

**Lecture:** Consultation of homework

**9<sup>th</sup> week:**

**Lecture:** Glass as building material (types of glass and properties of different glass types, mechanical and physical properties of glass, introduction in possibilities of creating load

bearing glass.)

**Seminar:** Bending tests of float glass.

**10<sup>th</sup> week:**

**Lecture:** Wooden material in building industry, mechanical and hydrotechnical properties

**Seminar:** Effects of fibre direction on properties of wood, force-deflection diagrams, determination of the Young's modulus etc.

**11<sup>th</sup> week:**

**Lecture:** Steel in engineering applications. Mechanical properties of hot and cold formed steel types. Stress-strain diagrams. Effects of carbon content on forming and welding of steel. Effect of temperature on the external work of steel.

**Seminar:** Laboratory tensile testing of steel (reinforcement). Hardness of steel.

**12<sup>th</sup> week:**

**Lecture:** Plastics in engineering applications.

**Seminar:** Tensile tests. Stress-strain diagrams.

**13<sup>th</sup> week:**

**Lecture:** Ceramic. History of ceramic. Strength and durability of ceramic material.

**Seminar:** Laboratory compression tests of brick.

**14<sup>th</sup> week:**

**Lecture:** Organic binder material (bituminous materials).

**Seminar:** Water tightness

**15<sup>th</sup> week:**

**Lecture:** End-term test, Deadline for homework

**Self Control Test**

### Requirements

Topics: The lectures are focused on the material properties of material constructions. It reviews the manufacturing and the requirements of different material constructions 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 glass types. Types of ceramic, plastic and wooden material, etc. The presentations are in connection with laboratory tests of material constructions.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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. In case of missed practicals, the student can attend a practice class with another group, being discussed with the tutor. The attendance on practice will be recorded by the practice leader. Students are required to bring calculators for the course with them to each practice. Students have to submit all the laboratory tasks in a form of a report as a scheduled minimum on a sufficient level. During the semester there is one test: the end-term test in the 15th week and the deadline for homework is also in the 15th week. The homework is: to write an essay about a type of building material, which is freely chosen by the student and previously discussed with the tutor.

B, for a grade: The course ends in mid-semester grade (AW5). Based on the test result and homework, the mid-semester grade is calculated as 70% of the test (max. 70 points) + 30% of homework (max. 30 points):

- The minimum requirement for the end-term test and homework is 50%. At least min. 50% of the test (min. 35 points) and also of the homework (min. 15 points) should be collected. Based on the score of the tests and homework, the grade is given according to the following table: Score Grade 0-49 fail (1) 50-62 pass (2) 63-75 satisfactory (3) 76-87 good (4) 88-100 excellent (5) If the score of the test is below 35 points, the student once can take a retake test of the whole semester material.

### Required reading materials

*Hegger M., Auch-Schwelk V., Fuchs M., Rosenkranz T. : Construction Materials Manual*

Birkhäuser Edition . ISBN: 3-7643-7570-1

*Stephen Timoshenko : Strength of Materials: Elementary Theory and Problems*

Van Nostrand, 1955.

*Pankhardt, K. : Load bearing glasses*

Lambert Academic Publishing, 2012. ISBN: 978-3-8473-2191-0

*Schulitz, Sobek, Habermann W.: Steel Construction Manual*

Birkhäuser Publishers, 2000. ISBN: 3-7643-6168-6

*Herzog T., Natterer J., Schweizer R., Volz M. , Winter W. : Timber Construction Manual*

Birkhäuser Edition . Birkhäuser Publishing, 2004. ISBN: 3-7643-7025-4

*Pfeifer G., Ramcke R., Achtziger J. et. al. : Masonry Construction Manual*

Birkhäuser Publishing, 2001. ISBN: 978-3-7643-6543-1

*Knippers J., Cremers J., Gabler M., Lienhard J.: Plastic and Membranes Construction Manual*

Birkhäuser Architecture, 2012. ISBN: 978-3-0346-0726-1

Subject: **CONSTRUCTION MATERIALS II**

Coordinator: **Kinga Nehme**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Preparation, course-up, description of subject requirements, description of course schedule, description of the course literature lists, registration week.

**2<sup>nd</sup> week:**

**Lecture:** Mortars. Classification of mortars. Masonry. Plasters. Bedding and covering mortars. Surface and wall-forming mortars. Waterproof cement mortar. Special-purpose mortars. Special concrete types. (Mass concrete, fiber, recycled, lightweight concrete, self-compacting, high strength, looking ...)

**Seminar:** Special concrete types (four kinds of mix / break). Distribute of homework: small expertise: Usage of construction materials through good and bad examples shown.

**3<sup>rd</sup> week:**

**Lecture:** Wood. Structure and organization of a tree, types of wood. Wood defects, tree diseases. Physical and mechanical properties of natural wood. Products of wood. Machining. Protection of wood.

**Seminar:** Special concrete types (four kinds of mix / break). Distribute of homework: small expertise: Usage of construction materials

through good and bad examples shown.

**4<sup>th</sup> week:**

**Lecture:** Metals I. Characterization of metals. Types of metals. Rheology II. Metallic bond. Structure of metal. Production of steel. Mechanical properties of steel. Types of iron and steel. Hardness, impact strength and test tools. Weldability.

**Seminar:** Construction of wood (moisture content, compressive strength, flexural strength, modulus of elasticity).

**5<sup>th</sup> week:**

**Lecture:** Metals. II Aluminum and its alloys. Other metals used in the construction industry (copper, zinc...)

**Seminar:** Construction wood (moisture content, compressive strength, flexural strength, modulus of elasticity).

**6<sup>th</sup> week:**

**Lecture:** Plastics. The properties of plastics. usage of special plastics. Composites, for example glass-fiber reinforced plastic, tarpaulins. Adhesives. (Single-and multi-component material) Insulation systems and materials. Heat, water, - sound. Inorganic, organic insulating

materials and their properties. Materials of sound control. Acoustic material characteristics. Waterproofing materials. Bituminous waterproofing membranes, plastic films and sheets for waterproofing.

**Seminar:** Metal types. Metal products. Steel reinforcing. (hot rolled, cold drawn, tensile strength, yield point, contraction, hardness(Poldi), impact strength at special temperature(Charpy)).

**7<sup>th</sup> week:**

**Lecture:** Bitumen and asphalt. The definition of bitumen, tar and asphalt. Bitumen varieties. Usage of bitumen. Sealants, paints, surface protection. Pigments. The binders for paint and thinner types. Other ingredients of paint. The most important properties of paint and their testing.

**Seminar:** Types of metal. Metal products. Steel reinforcing. (hot rolled, cold drawn, tensile strength, yield point, contraction, hardness(Poldi), impact strength at special temperature(Charpy)).

**8<sup>th</sup> week:**

**Lecture:** Types of ceramics. The concept and splitting of building ceramics. The manufacturing technology of ceramics. Porous products. The properties of masonry and tile, their classification, and examinations.

**Seminar:** Types of plastic. PVC, PE, PP, fire resistance, chemical resistance. Presentation of composite, fiber-reinforced plastics, such as glass, carbon fiber material types. Insulation systems. Heat, water, - sound insulation of material types and their requirements. Paint. Opacity, layer thickness, coverage.

**9<sup>th</sup> week:**

**Lecture:** A mid-year planning task: semi-annual consultations related tasks previously announced time, writing midterm.

**10<sup>th</sup> week:**

**Lecture:** Types of deformation. (creep, relaxation, spontaneous deformation of different building materials)Rheological material model III.

**Seminar:** Types of plastic. PVC, PE, PP, fire resistance, chemical resistance. Presentation of composite, fiber-reinforced plastic types, such as glass, carbon fiber material. Insulation systems. Heat, water, - sound insulation material types and their requirements. Kinds of paint. Opacity, layer thickness, coverage.

**11<sup>th</sup> week:**

**Lecture:** Diagnostics (errors and their causes, cracks), quality control.

**Seminar:** Deformations. Spontaneous deformation, thermal expansion of aluminum, firing shrinkage of ceramic types, swelling, lime at, shrinkage-swelling measurement for example on concrete specimens ( Demec, Huggenberger ...) Ceramic. Types: wall, floor, hull components and their requirements, thermal properties.

**12<sup>th</sup> week:**

**Lecture:** Non-destructive testing (Schmidt hammer, ultrasound, x-ray).Submission of homework.

**Seminar:** Deformation types. Spontaneous deformation, thermal expansion of aluminum, firing shrinkage of ceramic types, swelling, lime at, shrinkage-swelling measurement for example on concrete specimens ( Demec, Huggenberger ...) Ceramics. Types: wall, floor, hull components and their requirements, thermal properties.

**13<sup>th</sup> week:**

**Lecture:** Durability-Corrosion I.: Concrete (exposure classes, types of corrosion, construction planning issues)Durability-Corrosion II.: Types of metal and other material (corrosion types, different forms of construction materials), material compatibility. (chemical, physical compatibility for example thermal expansion, working together, technical information .)

**Seminar:** Diagnostics and devices. (Poldi, Schmidt)Nondestructive testing and evaluation. Durability. Schmidt hammer, ultrasound. Corrosion. Compatibility. Carbonation, chlorides statement and description of phenomena such as efflorescence, improving surfaces.

**14<sup>th</sup> week:**

**Lecture:** Writing midterm test (theory and practice).

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Manufacture and repair of semi-annual planning tasks. Semi-annual consultations related tasks previously announced time, writing midterm and additional midterm tests.

## Requirements

Topics: Glass as a 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 hydrotechnical 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. Effects 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.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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. In the case of missed practicals, a student can attend a practice class with another group, being discussed with the tutor. Attendance at practice will be recorded by the practice leader. Students are required to bring a calculator for the course to each practice class. Students have to submit all the laboratory tasks in a form of a report as a scheduled minimum at sufficient level. During the semester there are two tests: the end-term test in the 15th week and the deadline for the homework is also on the 15th week. The homework: to write an essay about a type of building material, which is freely chosen by the student and previously being discussed with the tutor.

B, for a grade: The course ends in exam (ESE). Based on the test result and homework, the mid-semester grade is calculated as 70% of the test (max. 70 points) + 30% of homework (max. 30 points): • The minimum requirement for the end-term test and homework is 50%. At least min. 50% of the test (min. 35 points) and also of the homework (min. 15 points) should be collected. Based on the score of the tests and homework, the grade is given according to the following table: Score Grade 0-49 fail (1) 50-62 pass (2) 63-75 satisfactory (3) 76-87 good (4) 88-100 excellent (5) If the score of test is below 35 points, a student once can take a retake test covering the whole semester material.

## Required reading materials

*Hegger M., Auch-Schwelk V., Fuchs M., Rosenkranz T. : Construction Materials Manual*  
Birkhäuser Edition . ISBN: 3-7643-7570-1

*Schulitz, Sobek, Habermann W.: Steel Construction Manual*  
Birkhäuser Publishers, 2000. ISBN: 3-7643-6168-6

*Herzog T., Natterer J., Schweizer R., Volz M. , Winter W. : Timber Construction Manual*  
Birkhäuser Edition . Birkhäuser Publishing, 2004. ISBN: 3-7643-7025-4

*Schittich, C., Staib, G., Balkow, D., Schuler, M., Sobek, W. : Glass Construction Manual*  
Birkhäuser Publishers, 1999. ISBN: 3-7643-6077-1

*Pankhardt, K. : Load bearing glasses*  
Lambert Academic Publishing, 2012. ISBN: 978-3-8473-2191-0

*Pfeifer G., Ramcke R., Achtziger J. et. al. : Masonry Construction Manual*  
Birkhäuser Publishing, 2001. ISBN: 978-3-7643-6543-1

*Knippers J., Cremers J., Gabler M., Lienhard J.: Plastic and Membranes Construction Manual*  
Birkhäuser Architecture, 2012. ISBN: 978-3-0346-0726-1



Subject: **GEOLOGY**

Coordinator: **József Garai**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** Course Introduction. Formation and origin of the Earth. Planetary geology. Structure of the Earth. Syllabus, polices.

**2<sup>nd</sup> week:**

**Lecture:** Plate tectonics. See floor spreading. Rock magnetism. Plate boundaries. Subductions. Homework assignment.

**3<sup>rd</sup> week:**

**Lecture:** Minerals. What is mineral? Physical properties. Classification. Crystalline structure. Silicate minerals. Video about the formation of the Earth.

**4<sup>th</sup> week:**

**Lecture:** Rocks. Igneous, platens and volcanoes. Formation, composition and classification. Rock identification.

**5<sup>th</sup> week:**

**Lecture:** Sedimentary rocks and sedimentation. Metamorphism and metamorphic rocks. Rock identification.

**6<sup>th</sup> week:**

**Lecture:** Geologic times (absolute, relative). Fossils, evolution, extinction. Preparation for the first test.

**7<sup>th</sup> week:**

**Lecture:** Midterm Test (100 minutes). Geologic history.

**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Stratigraphy. Principles of stratigraphy.

Geologic mapping. Mapping. Problems in stratigraphy.

**9<sup>th</sup> week:**

**Lecture:** Earthquakes. Mechanism, types, observations, scales, prediction. Midterm Test making up.

**10<sup>th</sup> week:**

**Lecture:** Mountain ranges. Geologic structures. Formation of folds and faults. Consultation of the HW assignment.

**11<sup>th</sup> week:**

**Lecture:** Surface processes. Mass wasting, stream, groundwater, glaciers.

**12<sup>th</sup> week:**

**Lecture:** Geologic evolution of Hungary. Reading and understanding geologic maps.

**13<sup>th</sup> week:**

**Lecture:** Hydrogeology. Geologic resources. Environmental geology. Climate changes. Milankovic cycles. Problem solving. Preparation for the second test.

**14<sup>th</sup> week:**

**Lecture:** End-semester test. Homework assignment. Preparation for the verbal exam.

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Making up the end-semester test.

## Requirements

A, for a signature: Attendance: Participation at lectures is a critia to successful completion of this course. Participation at laboratory/problem solving classes is compulsory. More than 3 causeless absences result non-completion of the course. There is not any make-up lab with another group. Test and examination questions will include items covered in lectures that are not covered in the

textbook or other distributed notes.

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: Score Grade 0-60 (F) fail (1) 61-70 (D) pass (2) 71-80 (C) satisfactory (3) 81-90 (B) good (4) 91-100 (A) excellent (5) Grading of the course: Midterm test 20% End-semester test 20% Final (verbal exam) 60% A verbal exam (ESE) 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 in the Neptune.

### Required reading materials

*Bell, F. G.: Fundamentals of engineering geology*  
Butterwords, 1983.

*Bell, F. G.: Engineering geology*  
2nd. Elsevier, 2007.

*Thomson, G.R. and Turk, J.: Modern Physical Geology*  
Sounders College Publishing,  
*A division of Holt*  
Rinehart and Winston Inc, 1991.

Subject: **GEOTECHNICS I**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Course Introduction. Geotechnical Engineering. Factors of safety and load. Standards and codes of practice.

**Seminar:** Syllabus, polices, introduction. Lab. introduction. Eurocode.

**2<sup>nd</sup> week:**

**Lecture:** Soil explorations. Site investigations, boring and sampling.

**Seminar:** Boring equipments and sampling. Home Work assignment (Preparation of soil mechanics report and recommendations.).

**3<sup>rd</sup> week:**

**Lecture:** Soil particle sizes and distribution. Weight-volume relationships of soils.

**Seminar:** Sieving and sedimentation test.

**4<sup>th</sup> week:**

**Lecture:** Index tests and classification of soils. Soil compaction.

**Seminar:** Atterberg limit tests. Liquid (Casagrande and fall cone tests), Saturated,

Plastic and Shrinkage tests. Proctor test.

**5<sup>th</sup> week:**

**Lecture:** Darcy's law for ground water. Seepage, permeability. Field measurement of permeability. Permeability of laminated soil.

**Seminar:** Preparation for Test 1. Problem solving.

**6<sup>th</sup> week:**

**Lecture:** Mid term test (100 minutes).

**Seminar:** Determining the permeability coefficient by constant, and falling head permeameter tests.

**Self Control Test**

**7<sup>th</sup> week:**

**Lecture:** Stress in soils (total and effective).

**Seminar:** Making up for the midterm test.

**8<sup>th</sup> week:**

**Lecture:** Mohr's circle. Shear strength of soil.

**Seminar:** Solving total, effective and neutral stress problems.

**9<sup>th</sup> week:**

**Lecture:** Measurement of shear strength. Triaxial compression tests. Shear strength of granular and fine-grained soil types.

**Seminar:** A Shear box and triaxial test. Soil strength problems.

**10<sup>th</sup> week:**

**Lecture:** Compressibility of soil. Theory for one dimensional consolidation. Oedometer test, including wetting-induced collapsibility of loess and overconsolidation ratio.

**Seminar:** Oedometer test.

**11<sup>th</sup> week:**

**Lecture:** Shrinkage and swell problems. Ground freezing.

**Seminar:** Requirements, structure and content of the soil mechanics report/recommendation.

**12<sup>th</sup> week:**

**Lecture:** Capillarity. Seepage pressures and

hydraulic failing. Theory of filter criteria. Liquefaction.

**Seminar:** Drawing supplements of the HW (Plan view, Borehole log, cross section.).

**13<sup>th</sup> week:**

**Lecture:** : Ground water. Yearly change of the water table at continental climate. Predicting water table depths in space and time using a regionalized time series model.

**Seminar:** Determining the expected highest water level for the HW problem.

**14<sup>th</sup> week:**

**Lecture:** End-semester test.

**Seminar:** Homework assignment is due. Preparation/instructions for the verbal exam.

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Making up the end-semester test.

### Requirements

A, for a signature: Attendance: Participation at lectures is a criteria to successful completion of this course. Participation at laboratory/problem solving classes is compulsory. More than 3 causeless absences result non-completion of the course. There is not any make-up lab with another group. Test and examination questions will include items covered in lectures that are not covered in the textbook or other distributed notes.

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: Score Grade 0-60 (F) fail (1) 61-70 (D) pass (2) 71-80 (C) satisfactory (3) 81-90 (B) good (4) 91-100 (A) excellent (5) Grading of the course: Mid term test 15% End of semester 15% Homework assignment 15% ESE (verbal exam) 55% A verbal 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 in the Neptune.

### Required reading materials

*Atkinson, J.: The Mechanics of Soils and Foundations*  
2nd. Taylor and Francis, 2007.

*Powrie, W.: Soil Mechanics Concepts and Applications*  
3rd. CPR Press, 2014.

*Lancelotta, R.: Geotechnical Engineering. Balkema*  
Brookfield, 1995.

*Craig, R. F.: Craig's Soil Mechanics*  
Spon Press, 2004.

*Kempfert, H. G., Gebreselassie, B.: Excavations and Foundations in Soft Soils*

Springer, 2006.

*Terzaghi, K., Peck, R.: Soil mechanics in engineering practice*

John Wiley and Sons, 1943.

*Lambe, J., Whitman, G.: Soil mechanics, SI-Version*

John Wiley and Sohn, 1979.

*Lunne, T., Robertson, P. K., Powell, J. J. M.: Cone penetration testing in geotechnical practice*

Spon / Routledge, 2002.

*Whitlow, R.: Basic soil mechanics*

Longman Scientific and Technical, 1990.

*Terzaghi, K.: Theoretical soil mechanics*

John Wiley and Sons, 1943.

Subject: **GEOTECHNICS II**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Course Introduction. Determination of a cross-section area and calculating the volume of soil. Diagrams and distribution of mass.

**Seminar:** Syllabus, polices, introduction.

**2<sup>nd</sup> week:**

**Lecture:** Parameters, factors for design of slopes. Types of instability of slopes. Stress change on slopes.

**Seminar:** Homework assignment on slope stability (I/1).

**3<sup>rd</sup> week:**

**Lecture:** Influence of water on the stability of slopes. Stability of infinite slopes. Influence of seepage on stability.

**Seminar:** Homework assignment on slope stability (I/2).

**4<sup>th</sup> week:**

**Lecture:** Stability of vertical cut. Behavior of simple excavations.

**Seminar:** Homework assignment on slope stability (I/3).

**5<sup>th</sup> week:**

**Lecture:** A compaction process. Relevant laboratory and field testing for soil properties and compaction. Compaction equipment; application for various materials. Quality control and testing requirements

**Seminar:** Homework assignment (I) is due.

**6<sup>th</sup> week:**

**Lecture:** Lateral earth pressure at rest. Rankine's lateral earth pressures (active, passive). Earth pressure with sloping backfill.

**Seminar:** Problem solving for midterm test.

**7<sup>th</sup> week:**

**Lecture:** Midterm Test

**Seminar:** Homework assignment on a retaining wall (II/1).

**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Graphic solution for Coulomb's active earth pressure (Culmann's solution). Active and passive force with earthquake force. Calculating earth pressures for drained and undrained loading.

**Seminar:** making up the midterm test.

**9<sup>th</sup> week:**

**Lecture:** Types of retaining structures (Gravity walls, cantilever walls, anchored or propped walls). Pressure on retaining wall due to surcharge. Failure of retaining walls.

**Seminar:** Homework assignment on a retaining wall (II/2)

**10<sup>th</sup> 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.

**Seminar:** Retaining wall homework assignment (II/3)

**11<sup>th</sup> 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 criteria)

**Seminar:** Homework assignment (II) is due.

Homework assignment on dewatering (III/1)

**12<sup>th</sup> 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 a water table.

**Seminar:** Homework assignment on dewatering (III/2)

**13<sup>th</sup> week:**

**Lecture:** Geosynthetics.

**Seminar:** Homework assignment on dewatering (III/3)

**14<sup>th</sup> week:**

**Lecture:** End-term test.

**Seminar:** Homework assignment (III) is due. Preparation/instructions for the verbal exam.

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Making up the end-term test.

### Requirements

A, for a signature: Attendance: Participation at lectures is a criteria to successful completion of this course. Participation at laboratory/problem solving classes is compulsory. More than 3 causeless absences result non-completion of the course. There is not any make-up lab with another group. Test and examination questions will include items covered in lectures that are not covered in the textbook or other distributed notes.

B, for a grade: Completion of the course: Submitting the homework assignments in time. Preparing your homework in a professional manner and show all steps and all calculations. 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: Score Grade 0-60 (F) fail (1) 61-70 (D) pass (2) 71-80 (C) satisfactory (3) 81-90 (B) good (4) 91-100 (A) excellent (5) Grading of the course: Mid term test 15% End of semester 15% Slope stability HWA10% Retaining wall HWA 10%. Dewatering HWA 10 % ESE (verbal exam) 40% A verbal exam (ESE) 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 in the Neptune.

### Required reading materials

*Bell, F. G.: Engineering Geology and Construction*  
Taylor and Francis, 2004.

*Hausmann, M.: Engineering principles of ground modification*  
Mc Graw – Hill Publishing Company, 1986.

*Kempfert, H. G., Gebreselassie, B.: Excavations and Foundations in Soft Soils*  
Springer, 2006.

*Koerner, R. M.: Designing with Geosynthetics*  
Prentice Hall, 2005.

*Atkinson, J.: The Mechanics of Soils and Foundations*  
2nd. Taylor and Francis, 2007.

*Powrie, W.: Soil Mechanics Concepts and Applications*  
3rd. CPR Press, 2014.

Subject: **GEOTECHNICS III**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Course Introduction. Types of foundations. Shallow strip foundations (footings). The 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)

**Seminar:** Syllabus, polices, introduction.

**2<sup>nd</sup> week:**

**Lecture:** Bearing capacity enhancement factors to account for shape, depth and weight. Bearing capacity of homogeneous and layered soils. The effect of a water table. Shallow foundations subject to horizontal and moment loads.

**Seminar:** Shallow foundation HWA (I/1)

**3<sup>rd</sup> week:**

**Lecture:** Soil structure interaction principles. Contact pressure distribution. Factors influencing contact pressure distribution beneath rigid and flexible footings. Concentrically and eccentrically loaded cases.

**Seminar:** Shallow foundation HWA (I/2)

**4<sup>th</sup> week:**

**Lecture:** Idealized elastic soil behavior. Stress distribution under foundations. Consolidation theories.

**Seminar:** Shallow foundation HWA (I/3)

**5<sup>th</sup> week:**

**Lecture:** Settlement analysis of shallow foundations on clay and sand.

**Seminar:** Shallow foundation HWA (I/4)

**6<sup>th</sup> 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.

**Seminar:** Problems preparing for the midterm test.

**7<sup>th</sup> week:**

**Lecture:** Midterm Test

**Seminar:** Settlement estimation HWA (II/1)

**8<sup>th</sup> week:**

**Lecture:** Fundamentals of Deep Foundations. Pile Foundations. Pile types. Pile driving and allowable stresses. Construction, inspection, specifications and case histories.

**Seminar:** Test making up (Midterm).

**9<sup>th</sup> 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.

**Seminar:** Settlement estimation HWA (II/2)

**10<sup>th</sup> week:**

**Lecture:** Soil-Structure Interaction for Deep Foundations. Axial loading of deep foundations. Base resistance of a single pile.

**Seminar:** Piled foundation HWA (III/1)

**11<sup>th</sup> week:**

**Lecture:** 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.

**Seminar:** Piled foundation HWA (III/2).

**12<sup>th</sup> week:**

**Lecture:** Pile testing and driving formulas.  
Wave equation analyses. Capacity of pile groups  
**Seminar:** Piled foundation HWA (III/3)

**13<sup>th</sup> week:**

**Lecture:** Special foundations. Foundation design in relation to ground movements. Foundation on recent refuse fills. Design of Foundation for seismic forces. Foundations on swelling soils.  
**Seminar:** Problems preparing for the end-

semester test.

**14<sup>th</sup> week:**

**Lecture:** End-semester Test  
**Seminar:** Preparation/instructions for the verbal exam.

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Test making up (End of Semester).

### Requirements

A, for a signature: Attendance: Participation at lectures is a criteria to successful completion of this course. Participation for the problem solving classes is compulsory. More than 3 causeless absences result non-completion of the course. There is not any make-up lab with another group. Test and examination questions will include items covered in lectures that are not covered in the textbook or other distributed notes.

B, for a grade: Completion of the course: - Submitting the homework assignments in time. - Preparing your homework in a professional manner and show all steps and all calculations. - Participating at least 70% of laboratory/problem solving. - D or higher grades for both tests. There is one make-up test for each. Grading of the tests: Score Grade 0-60 (F) fail (1) 61-70 (D) pass (2) 71-80 (C) satisfactory (3) 81-90 (B) good (4) 91-100 (A) excellent (5) Grading of the course: Mid term Test 12% End-semester Test 12% Shallow foundation HWA 20% Settlement estimation HWA 6% Piled foundation HWA 10% Final ESE (verbal exam) 40% A verbal exam is taken at the end of the semester in the exam period. Students have to sign up for the scheduled exam minimum in the Neptune two days in advance.

### Required reading materials

*Chang-Yu Ou: Deep Excavations*

Taylor and Francis, 2006.

*Dandy, G., Walker, D., Daniell, T., Warner, R.: Planning of Engineering Systems*

Taylor and Francis, 2006.

*Fang, H. S.: Foundation Handbook*

Chapman and Hall, 1990.

*Lancelotta, R.: Geotechnical Egeineering. Balkema*

Brookfield, 1995.

*Mitchell, J. K.: Fundamentals of soil behaviour*

1976. ISBN: John Wiley and Sons

*Moseley, M. P., Kirsch, K.: Ground Improvement*

Taylor and Francis, 2004.

*Tomlinson, M. J.: Foundation design and construction*

Pearson Education, 2001.

*Atkinson, J.: The Mechanics of Soils and Foundations*

2nd. Taylor and Francis, 2007.

*Powrie, W.: Soil Mechanics Concepts and Applications*

3rd. CPR Press, 2014.

*Das, B.M. : Principles of Geotechnical Engineering*

7th, 8th. Thomson Publishing , 2006.

*Duncan, J.M . and Wright, S.G.: Soil Strength and Slope Stability*

Wiley, 2005.

Subject: **URBAN & REGIONAL DEVELOPMENT**

Coordinator: **György Csomós**

Year, Semester: 1<sup>st</sup> year/1<sup>st</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** Urban sprawl. Classification of cities and towns in Hungarian and global relations. Types of cities regarding their sizes, morphology, function, economic and administrative roles.

**2<sup>nd</sup> week:**

**Lecture:** Urban planning theories: Rational planning, Synoptic planning, Participatory Planning, Incrementalism, Mixed scanning model, Transactive planning, Advocacy planning, Bargaining model, Communicative approach.

**3<sup>rd</sup> week:**

**Lecture:** Comparison of planning and development processes: examples from the United States, the European Union, Japan, China, and Hungary.

**4<sup>th</sup> week:**

**Lecture:** The role of participants: citizens, local governments, bodies of the public administration, the national government, real estate developers, and financial organizations.

**5<sup>th</sup> week:**

**Lecture:** Integrated sustainable urban development: urban development policy of the European Union. Objectives for 2014-2020 programming period.

**6<sup>th</sup> week:**

**Lecture:** Urban planning in Hungary. Legacy of the state socialism and reforms after transition. Effects of the EU's urban development policies on Hungary's urban planning process.

**7<sup>th</sup> week:**

**Lecture:** New deals for the 2014-2020 programming period: Regional and Urban Development Operational Program.

**8<sup>th</sup> week:**

**Lecture:** Taxonomy of regions from different approaches. Introducing the EU's NUTS system.

**9<sup>th</sup> week:**

**Lecture:** Economic development theories I: Export Base Theory, Capital Fundamentalism, Neoclassical Growth Theory, Endogenous Growth Theory, Trade Theory and Location, Cumulative Causation and Polarization.

**10<sup>th</sup> week:**

**Lecture:** Economic development theories II: Regional Industry Clusters, Entrepreneurship Theories, Functional Specialization, Innovation and Innovational Systems, Growth versus Development, Government & Economic Development.

**11<sup>th</sup> week:**

**Lecture:** Economic development theories III: The growth pole strategy by Perroux.

**12<sup>th</sup> week:**

**Lecture:** History of regional development in Hungary from 1945 to 2004.

**13<sup>th</sup> week:**

**Lecture:** Regional development in Hungary after the EU accession.

**14<sup>th</sup> week:**

**Lecture:** Components of regional development: Economy, housing, transport, and environment.



**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

**Requirements**

A, for a signature: Attendance at lectures is recommended, but not compulsory.

B, for a grade: The course ends in a mid-semester grade (AW5). Based on the average of the marks of the mid-term and the end-term results, the mid-semester grade is calculated as an average of them: - the average grade of the two tests (50-50%) 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 table: 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.

**Required reading materials**

*Andy Pike, Andres Rodriguez-Pose, John Tomaney: Local and Regional Development*  
Taylor & Francis, 2006.

*John Glasson, Tim Marshall: Regional Planning.*  
Routledge, Abingdon, 2007.

*Nigel Taylor: Urban Planning Theory since 1945*  
Sage, London, 2007.

Subject: **TRANSPORTATION ENGINEERING I**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Basics of transportation. Territory of a road. Road networks in Hungary. Using regulations.

**Seminar:** Contour-map, a dale, a saddle-point, a river on the map, points of the compass, a scale. Design parameters.

**2<sup>nd</sup> week:**

**Lecture:** Categories of roads. Parameters of vehicles and roads.

**Seminar:** Contour gradient. Filling, cutting.

**3<sup>rd</sup> week:**

**Lecture:** Geodesy, geographical and geotechnical parameters in road planning.

**Seminar:** A site plan. Straight roads, curves. Road axis – contour gradient.

**4<sup>th</sup> week:**

**Lecture:** Dewatering of roads.

**Seminar:** Calculating horizontal curves. Segmentation.

**5<sup>th</sup> week:**

**Lecture:** Intersections. Sight distances. Road safety.

**Seminar:** Long-sections. Levels of a site. Levels of a road axis.

**6<sup>th</sup> week:**

**Lecture:** Public transport facilities.

**Seminar:** Calculating vertical curves.

**7<sup>th</sup> week:**

**Lecture:** Consultation.

**Seminar:** Consultation.

**8<sup>th</sup> week:**

**Lecture:** Mid-term test

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Bicycle roads.

**Seminar:** Sample cross sections.

**10<sup>th</sup> week:**

**Lecture:** Parking facilities

**Seminar:** Consultation.

**11<sup>th</sup> week:**

**Lecture:** Accessibility.

**Seminar:** Consultation.

**12<sup>th</sup> week:**

**Lecture:** Structure of pavements. Asphalt pavements.

**Seminar:** Consultation.

**13<sup>th</sup> week:**

**Lecture:** Concrete and stone pavements

**Seminar:** Consultation.

**14<sup>th</sup> week:**

**Lecture:** Consultation.

**Seminar:** Consultation.

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

A, for a signature: Attendance at lectures and practicals is recommended, but not compulsory. Students have to submit both tests. Students have to finish the project in acceptable quality. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade (AW5): The course ends with a final test. The grade is calculated as an average of the tests: - the mid-term test 25% - the end-term test 25% - the final test 50% The minimum requirement for the final test, the mid-term test and the end-term test is 60%. The grades for the tests is given according to the following table: Score Grade 0-36 fail (1) 37-42 pass (2) 43-48 satisfactory (3) 49-54 good (4) 55-60 excellent (5) If the score of any test is below 37, the student once can take a retake test, of the material of all the tests.

Subject: **TRANSPORTATION ENGINEERING II**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Preparation, course-up, subject description, literature description

**Seminar:** Preparation, course-up, subject description, literature description

**2<sup>nd</sup> week:**

**Lecture:** Elements, a railway track and rolling contacts. Rail transport kinetic knowledge, active and passive forces (traction and resistance).

**Seminar:** Related to the basic concepts of a railway track dimension and practice calculations. Gauge and cross-section dimensions, logging.

**3<sup>rd</sup> week:**

**Lecture:** Rail transport kinetics. Motion Graphics motion characteristics. Transitional geometries and transition curves. Super elevation.

**Seminar:** Calculation of kinds of transport kinetic practice. Practice of associated driving resistance. Calculating kinds of resistance. Standard ramp calculation.

**4<sup>th</sup> week:**

**Lecture:** Arcs and curved arcs in transitional setting. Horizontal and vertical lines.

**Seminar:** Assigning homework that contains half a year modernization of railway lines in

planning stages and higher speeds.

**5<sup>th</sup> week:**

**Lecture:** Lines for detecting and tracks. Methods of subsoil exploration. Planning and licensing.

**Seminar:** Exercises on main points and detailed setting point in computing tasks. Description of the exercises and the usage of the "Railway setting tables."

**6<sup>th</sup> week:**

**Lecture:** Railway substructure concepts, parts. Objects and defenses. Drainage and dewatering processes. Off-level roads - railway crossings (crossings).

**Seminar:** Presentation and an exercise instructor contour map of the neutral line of inquiry.

**7<sup>th</sup> week:**

**Lecture:** A railway superstructure concept, development, and parts. Rails, sleepers, fastening elements and couplings. Rail welding. Bedding materials, sizes, design. Special body structures.

**Seminar:** Presentation of a railway sub-and superstructure construction.

**8<sup>th</sup> week:**

**Lecture:** Mid-term test

**Seminar:** Consultation

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** The capacity of railway. Loading forces. Rails, sleepers and ballast calculation of the revenue requirement.

**Seminar:** Consultation

**10<sup>th</sup> week:**

**Lecture:** Railway track dilation. The welded

track theory, conditions and requirements of installing.

**Seminar:** Practical knowledge of a welded track, establishment and maintenance related.

**11<sup>th</sup> week:**

**Lecture:** Concepts of bypasses, crossings, sidings. Concept, types and geometry of their parts.

**Seminar:** Bypass illustration practice

**12<sup>th</sup> week:**

**Lecture:** Standard and custom track circuits. Usage of switching hubs in tracks, development of rail network. Concepts and types of stations and railway stations.

**Seminar:** Consultation

**13<sup>th</sup> week:**

**Lecture:** A rail track wear process is inevitable. The process of formation water bags and their restoration. Restoration, (rehabilitation) renovation and modernization concept.

**Seminar:** Unique presentation of track circuits and calculating exercise triangular projection and systematic processes.

**14<sup>th</sup> week:**

**Lecture:** Establishment of railway, in case of construction and methods. Principles and methods of installing welded rail. The track maintenance concept instances.

**Seminar:** Consultation

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

Topics: Concepts of rail transport and rail tracks, their particularities and elements. Kinetics and kinematics of rail transport, its regularities. The theory and practice of track tracing, the basics of track planning. Substructure and superstructure of a train track, its structural formation, methods of estimating its bearing capacity. Theory of a rail-track without inter-space, its conditions and regulations. Types of railway intersections, creation of track networks, methods and elements of track connections. Ageing of a track, the principles of its building and maintenance.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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, being discussed with the tutor. During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

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 two tests The minimum requirement for the mid-term and end-term tests is 50%. Based on the score of the tests separately, the grade for the tests is given according to the following table: Score Grade 0-50 fail (1) 51-65 pass (2) 66-80 satisfactory (3) 81-90 good (4) 91-100 excellent (5)

### Required reading materials

*Jonathan T. Ricketts, M. Kent Loftin, Frederick S. Merritt: Standard Handbook for Civil Engineers*  
McGraw-Hill Publishing Company, 2003. ISBN: 0-07-136473-0

*M-Pressé plus s.r.o.: Railvolution*

URL: <http://www.railvolution.net/>

Subject: **BUILDING CONSTRUCTION I**

Coordinator: **Krisztina Kozmáné Szirtesi**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **2**

#### 1<sup>st</sup> week:

**Lecture:** Subject of building construction science. Primary and inferior structures of buildings. Effects on buildings, requirements.

**Practical:** issuing task 1 (homework drawing).  
Elaborating workshop drawing 1.

#### 2<sup>nd</sup> week:

**Lecture:** Horizontal load-bearing structures. Arches. Solid floors. Monolithic and prefabricated RC floor structures.

**Practical:** consultation of task 1 (homework drawing)

#### 3<sup>rd</sup> week:

**Lecture:** Frame-type buildings, architectural features. Structure of monolithic RC frame buildings, space limiting structures.

**Practical:** consultation of task 1 (homework drawing)

#### 4<sup>th</sup> week:

**Lecture:** Foundation.

**Practical:** consultation of task 1 (homework drawing)

#### 5<sup>th</sup> week:

**Lecture:** Under grade insulation

**Practical:** submitting task 1 (homework drawing).  
Elaborating workshop drawing 2.

#### 6<sup>th</sup> week:

**Lecture:** Pitched roof: roof truss and roofing 1.

**Practical:** Issuing task 2 (homework drawing).  
Elaborating workshop drawing 3.

#### 7<sup>th</sup> week:

**Lecture:** Mid-term test

**Practical:** consultation of task 2 (homework drawing)

**Self Control Test**

#### 8<sup>th</sup> week:

**Lecture:** Pitched roof: roof truss and roofing 1.

**Practical:** consultation of task 2 (homework drawing)

**9<sup>th</sup> week:**

**Lecture:** Flat roof.

**Practical:** consultation of task 2 (homework drawing)

**10<sup>th</sup> week:**

**Lecture:** Door (external and internal), window.

**Practical:** submitting task 2 (homework drawing). Issuing task 3 (homework drawing).

**11<sup>th</sup> week:**

**Lecture:** Floor, stairs.

**Practical:** consultation of task 3 (homework drawing)

**12<sup>th</sup> week:**

**Lecture:** Chimneys and ventilation shafts.

**Practical:** consultation of task 3 (homework drawing)

**13<sup>th</sup> week:**

**Lecture:** Floor finish.

**Practical:** consultation of task 3 (homework drawing)

**14<sup>th</sup> week:**

**Lecture:** Façade finish (envelope).

**Practical:** submitting task 3 (homework drawing).

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

### Requirements

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.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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, being discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments to each practice of the course. Active participation is evaluated by the teacher every class. If a student's behavior 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 on 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 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 125 points For a signature students must achieve more than 50% of points (63 points).

B, for a grade: The course ends in an exam (ESE). Mid-semester points: 125 points Colloquium (ESE): 50 points 175 points Score Grade 0-87 fail (1) 88-109 pass (2) 110-131 satisfactory (3) 132-153 good (4) 154-175 excellent (5)

## Required reading materials

*AMBROSE, James E.: Building structures*

Wiley, 1993. ISBN: 0471540609

*BÖHÖNYEY, J.: Building construction encyclopedia*

Iparterv, 1986.

Subject: **CAD MODELLING I**

Year, Semester: 1<sup>st</sup> year/2<sup>nd</sup> semester

Practical: **4**

**1<sup>st</sup> week:**

**Practical:** Presentation of the history of CAD. Presentation of the screen. Usage of palettes and tools.

**2<sup>nd</sup> week:**

**Practical:** Presentation of draw settings, customizing and settings. Detailed presentation of drop-down boxes and toolbars. Giving the coordinates and drawing with coordinates.

**3<sup>rd</sup> week:**

**Practical:** Introduction of draw (line, polygon, circle, arch, line chain, etc.) and draw modifying commands (erase, copy, mirror, array, move, rotate, etc.).

**4<sup>th</sup> week:**

**Practical:** Drawing practice.

**5<sup>th</sup> week:**

**Practical:** 1<sup>st</sup> test  
**Self Control Test**

**6<sup>th</sup> week:**

**Practical:** Presentation of draw settings, customizing and settings, drawing slab plan.

**7<sup>th</sup> week:**

**Practical:** Presentation of draw settings, customizing and settings, drawing slab plan.

**8<sup>th</sup> week:**

**Practical:** 2<sup>nd</sup> test  
**Self Control Test**

**9<sup>th</sup> week:**

**Practical:** Presentation of draw settings, customizing and settings for ground plan.

**10<sup>th</sup> week:**

**Practical:** Presentation of draw settings, customizing and settings, drawing ground plan.

**11<sup>th</sup> week:**

**Practical:** Presentation of draw settings, customizing and settings, drawing ground plan.

**12<sup>th</sup> week:**

**Practical:** Settings of printing. Semester summary.

**13<sup>th</sup> week:**

**Practical:** Drawing practice.

**14<sup>th</sup> week:**

**Practical:** 3<sup>rd</sup> test  
**Self Control Test**

**15<sup>th</sup> week:**

**Practical:** Repeat test.

## Requirements

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.

A, for a signature: Participation at practicals 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 class with another group. Attendance at practicals 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, being 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 every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his or 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 on a sufficient level.

B, for a grade: The course ends in a mid-semester grade (AW5). 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 table: 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 repeated test.

Subject: **THEORY OF DESIGN**

Coordinator: **Ádám Ungvárai**

Year, Semester: 2<sup>nd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction. Reviewing the basic knowledge of mechanics and mathematics.

**Practical:** Training Tasks of mechanics and mathematics. Issue of homework.

**2<sup>nd</sup> week:**

**Lecture:** Building and supporting structures; supporting structures requirements; its forms of failure. Modeling Issues: Capability ways of buildings; idealized support, public support, hierarchical structures, a two-dimensional

structural model.

**Practical:** Presentation of different structural buildings. Modeling of structures on horizontal loads, reinforcement of buildings, potential stability problems, spatial burden. Training tasks on mechanics and mathematics.

**3<sup>rd</sup> week:**

**Lecture:** Theory of Scaling basics; capacity, safety, risk, life, the concept of reliability; strength and stability.

**Practical:** The primary structural systems,

deconstructing, contacts, supports.  
 Demonstrating them on simple buildings.  
 Mathematics and mechanics tests.

**4<sup>th</sup> week:**

**Lecture:** Theoretical interpretation of the concept of limit state probabilities and different boundary conditions, distributed security, the partial factor method.

**Practical:** Burden concept: focused and distributed, static and dynamic, constant and possible burden.

**5<sup>th</sup> week:**

**Lecture:** Constant burden: weight; inclusion of standard payload.

**Practical:** Examples to weight analysis, the dead load and determine the payload. Sketch Plan submission.

**6<sup>th</sup> week:**

**Lecture:** Meteorological loads: a snow load, a wind load

**Practical:** Examples of weight analyses, a dead load and determining a payload. Examples of snow and wind load determination.

**7<sup>th</sup> week:**

**Lecture:** Wind load (continued), the effect of temperature

**Practical:** Examples of snow load and wind load determination. Keeping consultation. Accountability of work doing. Correction to a successful solution.

**8<sup>th</sup> week:**

**Lecture:** 1<sup>ST</sup> MIDTERM Knowledge, using the concepts learned. Dead weight, and any useful cargo value calculation

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Burden under construction; extraordinary burden, fire effects.

**Practical:** Examples of the determination of charges under construction presentation of the impact of fire and earthquakes.

**10<sup>th</sup> week:**

**Lecture:** Taking into account the impact of an earthquake

**Practical:** Examples of taking into account the impact of an earthquake. Keeping consultation. Accountability of the work done. Correction to a successful solution.

**11<sup>th</sup> week:**

**Lecture:** Simultaneity, different load conditions; Preparation of standard load combinations.

**Practical:** Examples of standard load combinations.

**12<sup>th</sup> week:**

**Lecture:** Standard load combinations (continued) Simple stresses for holding standard. The dimensioning of structures specific questions. State of emergencies.

**Practical:** Examples of standard load combinations. Keeping consultation. Accountability of the work done. Correction to a successful solution.

**13<sup>th</sup> week:**

**Lecture:** 2<sup>ND</sup> MIDTERM Knowledge, using the concepts learned. Internal forces calculation in case of complex structures and load combinations.

**Practical:** Submission of homework. Overlooking, the eligibility assessment.

## 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 misses does so, the subject will not be signed and the student must repeat the course. Half-year plan task: within the framework of the six-month task students have to prepare the full burden analysis of an optional building adequately. The instructions are given in the consultations and the practical occupations. In addressing this task, the following details must be mentioned: - A3 size plan sheet for presentation of the chosen building (history,



location, environment, photo documentation) - the presentation of a sketch plan on 2-3 plan sheets with an optional size (ground-plan, see-through plan, mending plan, segments, facades) 1:100 scales - fixing of recorded statics models on an A3 size plan sheet. -detailed static calculation, which includes the burden analysis, and the definition of the strains of the structural elements selected by the teacher. Basics of the mechanics and mathematics test: assignment of mathematical and mechanics knowledge repeated on the first and second educational week.

Topics: simple and complex, statically fixed structures base reactions, take-up diagrams, load function, practical processing depending on the relations between the shear force and bending functions, polynomials integration, derivation. Two opportunities are assured to make up the tests. The definition of the basic rate of burdens test: To the test writing it is useful to bring a calculator and the title is "Burdens and Effects". The definition of strains, a full burden analysis test two opportunities are assured to make up the tests. Students have to sit for the tests.

B, for a grade: Written and oral examination: during the written exam students have to prepare the burden analysis of a simple building or a structural element adequately as recorded in the wording of the task. During the oral part of the examination the teacher asks theoretical and practical questions according to the knowledge obtained in the course of a half-year. The course ends in mid-semester grade (AW5). Based on the average of the test results and the homework, the mid-semester grade (AW5) is calculated as an average of them: The minimum requirement for the end-term tests and homework is 80%. At least min. 45% of the test (min.45 points) and also of the homework (min. 80 points) should be collected. Based on the score of the tests and homework, the grade is given according to the following table: Score Grade 0-49 fail (1) 50-62 pass (2) 63-75 satisfactory (3) 76-88 good (4) 89-100 excellent (5)

### Required reading materials

*Eurocode: MSZ-EN-1990-2002/A1*

*Eurocode: MSZ-EN-1991-1-7*

*Eurocode: MSZ-EN-1998-1*

Subject: **STEEL STRUCTURES I**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Steel usage in structural building. History of steel structures. Failure forms of steel structures.

**Seminar:** Classification of cross-sections. Specific effects on steel structures.

**2<sup>nd</sup> week:**

**Lecture:** Tensile, compressive, shear and combined resistance of cross-sections.

**Seminar:** Tensile calculation, compressive, shear and combined resistance of cross-sections.

**3<sup>rd</sup> week:**

**Lecture:** Bolted joints of steel structures.

**Seminar:** Constructing bolted joints.

**4<sup>th</sup> week:**

**Lecture:** Welded joints of steel structures.

**Seminar:** Calculating welded joints.

**5<sup>th</sup> week:**

**Lecture:** Stability of structural elements. Design of bars under compression.

**Seminar:** Continue designing joints. Outgoing and discussion of the Design Task.

**6<sup>th</sup> week:**

**Lecture:** Design of structural elements under bending. Lateral torsional buckling.

**Seminar:** Design of bars under compression.

**7<sup>th</sup> week:**

**Lecture:** Design of structural elements under bending. Design of second order structural elements under bending.

**Seminar:** Design of beams under bending.

**8<sup>th</sup> week:**

**Lecture:** TEST1

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Truss girders

**Seminar:** Design of beams under bending.

**10<sup>th</sup> week:**

**Lecture:** Design of buildings with steel

structures.

**Seminar:** Lateral torsional buckling and local buckling.

**11<sup>th</sup> week:**

**Lecture:** Fabrication and installation of steel structures.

**Seminar:** Design of frame structures. Calculating imperfections.

**12<sup>th</sup> week:**

**Lecture:** Steel corrosion and fire protection.

**Seminar:** Consultation

**13<sup>th</sup> week:**

**Lecture:** Reserve week

**Seminar:** Consultation

**14<sup>th</sup> week:**

**Lecture:** TEST2

**Self Control Test**

### Requirements

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

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 three design tasks. Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. A student must attend practicals and may not miss more than three times during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. A student can't make up a practice with another group. The attendance at lectures and at practicals will be recorded by the staff of the department. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring the calculator and the printed materials of the lectures to each occasion (both lectures and practicals). Active participation is evaluated by the teacher in every class. Students' activity and participation is required.

Students have to submit all the two tests and the design tasks as scheduled minimum on a sufficient level. The minimum point of test and design task has to be taken. The minimum (required to have mid-semester grade) and maximum points can be obtained are the follows: Two tests: I. Test: Maximum: 30 points Minimum: 18 points II. Test: Maximum: 30 points Minimum: 18 points Summa: 60 points 36 points Design task: Maximum: 40 points Minimum: 25 points Summa points: Maximum: 100 points Minimum: 61 points The course ends with a mid-semester grade (AW5). Based on the summa points of the tests and the summa points of the design tasks, the mid-semester grade is defined by the following way: 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)

## Required reading materials

*Eurocode: Basis of structural design*

EN 1990:2002/A1:2005 .

*Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

2. EN 1991-1-1:2002 .

*MSZ: Design of steel structures Part 1-1.:General rules and rules for buildings*

EN 1993-1-1: 2009 .

*Eurocode 3: Design of steel structures - Part 1-8: Design of joints*

EN 1993-1-8:2005.

Subject: **REINFORCED CONCRETE STRUCTURES I**

Year, Semester: 2<sup>nd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Practical: **1**

### 1<sup>st</sup> week:

**Lecture:** History of concrete and reinforced concrete (RC) structures. Persons, engineers and inventors on the field of concrete construction. Mechanical and physical properties of structural concrete. Strengths, characteristic and design values of strengths, stress-strain relationships for concrete, design models for concrete behavior. Time dependent properties of concrete.

### 2<sup>nd</sup> week:

**Lecture:** Mechanical and physical properties of different reinforcement types (steel bars, welded meshes, prestressing materials). Strengths, characteristic and design values of yield strength, stress-strain relationships for steel bars, design curves for reinforcement. Corrosion of reinforcement. Classification of environmental conditions, determination of the concrete cover and notation.

### 3<sup>rd</sup> week:

**Lecture:** Bonds in concrete. Physical phenomena of a bond between concrete and reinforcement. Strength of a bond, length of anchorage, design length of anchorage. Behavior of an embedded steel bars in tension – unwounded and cracked sections, behavior of elastic and plastic. Normal force – elongation and moment – curvature relationships of reinforced concrete sections. Outgiving and discussion of the 1<sup>st</sup> Design Task.

### 4<sup>th</sup> week:

**Lecture:** Determination of moment capacity of reinforced concrete sections in bending having only tensioned reinforcement and having both tensioned and compressed reinforcement. Calculation of under-, normally and over reinforced concrete sections.

### 5<sup>th</sup> week:

**Lecture:** Design of reinforced concrete section only with tensioned and with both tensioned and compressed steel bars. Outgiving and discussion of the 2<sup>nd</sup> Design Task.

### 6<sup>th</sup> week:

**Lecture:** Calculation of the stress state of different RC cross sections in elastic (I. state of stresses), in cracked (II. state of stresses) and in ultimate limit states (III. state of stresses).

### 7<sup>th</sup> week:

**Lecture:** Design examples for determining the moment capacity of RC cross-sections reinforced on different ways; analysis of under reinforced, normally reinforced and over reinforced RC sections, determination or design of the reinforcement and the cross-section.

### 8<sup>th</sup> week:

**Lecture:** 1<sup>st</sup> Test. Handing in of the 1<sup>st</sup> Design Task. Handing in of the 2<sup>nd</sup> Design Task.

Outgiving and discussion of the 3<sup>rd</sup> Design Task.  
**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Shear in RC cross sections. Failure mode and crack pattern of different shear failure. Modeling of shear mechanisms by strut models. Equilibrium state of an inclined RC section. Shear force carried by the compressing concrete zone, dowel action, aggregate interlock, a role of shear reinforcement.

**10<sup>th</sup> week:**

**Lecture:** Determination of shear capacity of RC sections according to different model codes. Design of RC sections in shear.

**11<sup>th</sup> week:**

**Lecture:** Serviceability and Ultimate limit states. Stress limitation, crack limitation and deflection of RC structures. Approximate and accurate methods for serviceability.

**12<sup>th</sup> week:**

**Lecture:** Complex design of RC beams I.

**13<sup>th</sup> week:**

**Lecture:** Complex design of RC beams II.

**14<sup>th</sup> week:**

**Lecture:** Complex design of RC beams III.

**15<sup>th</sup> week:**

**Lecture:** 2<sup>nd</sup> Test. Hand in of the 3<sup>th</sup> Design Task  
**Self Control Test**

### Requirements

Topics: History of concrete and reinforced concrete (RC) structures. Mechanical properties of fresh and hardened (structural) concrete. Mechanical properties of reinforcing bars and 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 – curvature relationship of RC cross sections. Definition of the state of stresses for RC sections. Resistance of RC cross section in bending. Design of RC cross-sections. Shear behavior of RC members. Design of RC members in bending and shear. Limit states: design of RC members in ultimate limited states (ULS), analysis of RC members in serviceability states (SLS). Deflection control, crack width control, stress limitation. Complex design of RC beam.

Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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 at practicals will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, medical certificates needs to be presented. Missed practices should be made up for at a later date, being discussed with the tutor. Students are required to bring a 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 participation should be required by students. Students have to submit all the two tests and the three design 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 are seven design tasks. In order to take the mid-semester grade (AW5) – minimum (2) pass grade, – minimum point of the tests and the design tasks 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 following: Two tests: I. Test: Maximum: 30 points Minimum: 18 points II. Test: Maximum: 30 points Minimum: 18 points Summa: 60 points 36 points Three design tasks: 1. Design Task: Maximum: 15 points Minimum: 9 points 2. Design Task: Maximum: 10 points Minimum: 7 points 3. Design Task:

Maximum: 15 points Minimum: 9 points Summa: 40 points 25 points Summa points: Maximum: 100 points Minimum: 61 points The course ends with mid-semester grade (AW5). Based on the summa points of the tests and the summa points of the design tasks, 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)

### Required reading materials

- fib Bulletin 51 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 1. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883
- fib Bulletin 52 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 2. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883
- fib Bulletin 53 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 3. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883
- fib Bulletin 54 Structural Concrete : Textbook on behavior, design and performance*  
2nd – Volume 4. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883
- fib Bulletin 62 Structural Concrete : Textbook on behavior, design and performance*  
2nd – Volume 5. Federation International du Béton , 2012. ISBN: 1562-3610, 978-2-883
- Eurocode: Basis of structural design*  
EN 1990:2002/A1:2005 .
- Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*  
EN 1991-1-1:2002 .
- MSZ: Design of concrete structures Part 1-1.: General rules and rules for buildings*  
EN 1992-1-1: 2010 .
- MSZ: Design of concrete structures Part 1-2: General rules. Structural fire design*  
EN 1992-1-2: 2010 .

Subject: **TIMBER & MASONRY STRUCTURES**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** History of timber building structures: floors, roofs, walls and frames.

**Seminar:** History of timber building structures

**2<sup>nd</sup> week:**

**Lecture:** Mechanical properties of structural timber: yield strength, ultimate strength, elongation at failure; elastic modules, design values of material coefficients.

**Seminar:** Mechanical properties of structural timber

**3<sup>rd</sup> week:**

**Lecture:** Resistance of cross-section: tension, compression, bending moment, shear, bending and shearing, bending and axial force, bending, shear and axial force, torsion.

**Seminar:** Resistance of cross-section

**4<sup>th</sup> week:**

**Lecture:** Buckling resistance of members, uniform members in compression, and uniform members in bending.

**Seminar:** Buckling resistance of members

**5<sup>th</sup> week:**

**Lecture:** Connectors for timber structures. Engineering timber structures. Mechanical properties of masonry structures: yield strength, ultimate strength, elastic module, and design values of material properties.

**Seminar:** Connectors for timber structures

**6<sup>th</sup> week:**

**Lecture:** Reinforced and unreinforced masonry structures.

**Seminar:** Reinforced and unreinforced masonry structures.

**7<sup>th</sup> week:**

**Lecture:** Resistance of cross-section: compression, bending moment, shear, bending and shearing, bending and axial force, bending, shear and axial force.

**Seminar:** Resistance of cross-section: compression

**8<sup>th</sup> week:**

**Lecture:** Brick Structures , Design methods according to EC6.

**Seminar:** Brick Structures

**9<sup>th</sup> week:**

**Lecture:** Types and strength characteristics of

masonry. Non-reinforced and reinforced walls.

**Seminar:** Types and strength characteristics of masonry

**10<sup>th</sup> week:**

**Lecture:** Stone Structures, Design and valuation of load-bearing stone structures.

**Seminar:** Stone Structures

**11<sup>th</sup> week:**

**Lecture:** Mixed (stone and brick) walls

**Seminar:** Consultation

**12<sup>th</sup> week:**

**Lecture:** Consultation

**Seminar:** Consultation

**13<sup>th</sup> week:**

**Lecture:** Consultation

**Seminar:** Consultation

**14<sup>th</sup> week:**

**Lecture:** Consultation

**Seminar:** Consultation

**15<sup>th</sup> week:**

**Lecture:** Consultation

**Seminar:** Consultation

### Requirements

Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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 at practicals will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, medical certificates needs to be presented. Missed practices should be made up for at a later date, being discussed with the tutor. Students are required to bring a 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 participation should be required by students. Students have to submit all the two tests and the three design 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 are seven design tasks. In order to take the mid-semester grade – minimum (2) pass grade, – minimum point of the tests and the design tasks 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 following: Two tests: I. Test: Maximum: 30 points Minimum: 18 points II. Test: Maximum: 30 points Minimum: 18 points Summa: 60

points 36 points Three design tasks: 1. Design Task: Maximum: 15 points Minimum: 9 points 2. Design Task: Maximum: 10 points Minimum: 7 points 3. Design Task: Maximum: 15 points Minimum: 9 points Summa: 40 points 25 points Summa points: Maximum: 100 points Minimum: 61 points The course ends with mid-semester grade (AW5). Based on the summa points of the tests and the summa points of the design tasks, 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)

### Required reading materials

*Eurocode: Basis of structural design*

EN 1990:2002/A1:2005 .

*Eurocode 1 EN 1991-1-1:2002 : Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

*MSZ: Design of timber structures. Part 1-1: General. Common rules and rules for buildings*

EN 1995-1-1: 2010 .

*MSZ: Design of timber structures. Part 1-2: General. Structural fire design*

EN 1995-1-2: 2005 .

*MSZ: Design of masonry structures. Part 1-1: General rules for reinforced and unreinforced masonry structures*

EN 1996-1-1: 2009 .

*MSZ : Design of masonry structures. Part 2: Design considerations, selection of materials and execution of masonry*

EN 1996-2: 2006 .

*MSZ: Design of masonry structures. Part 3: Simplified calculation methods for unreinforced masonry structures*

EN 1996-3: 2006 .

*MSZ: Design of masonry structures. Part 1-2: General rules. Structural fire design*

EN 1996-1-2: 2005 .

*Eurocodes, EN 1990 and to applications use : Basis of structural design, Guide to Interpretative Documents for Essential Requirements*

4th. Watford, 2001.

*Jack Porteous & Abdy Kermani: Structural Timber Design to Eurocode 5*

Blackwell Publishing , 2009. ISBN: 978-14051-4638-8

Subject: **CONSTRUCTION MANAGEMENT I**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **1**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Management for Engineers:

MFMFE31X03-EN

**Seminar:** The issue of drawing task 1.Floor plan.

**2<sup>nd</sup> week:**

**Lecture:** Technology, building materials and

technology, the foundation, walls and columns / pillars.

**Seminar:** The issue of drawing tasks. Floor plan + section + nodes.

**3<sup>rd</sup> week:**

**Lecture:** Technology: floors, roofs and map overlays, traffic building

**Seminar:** Building visit

**4<sup>th</sup> week:**

**Lecture:** Technology, building systems, partitions, doors, windows, flooring.

**Seminar:** Consultation of the drawing task

**5<sup>th</sup> week:**

**Lecture:** Technology, engineering, electrical, mechanical lifts, heating and cooling, finishing work.

**Seminar:** Visiting a building.

**6<sup>th</sup> week:**

**Lecture:** ISO Utility Structures: scaffolding, supports.

**Seminar:** Consultation of the drawing task

**7<sup>th</sup> week:**

**Lecture:** An auxiliary structure: pattern sheets, formwork, trench supports

**Seminar:** Size and quantity statement in a tabular form.

**8<sup>th</sup> week:**

**Lecture:** This week is the preparation of semi-annual week of planning tasks: semi-annual consultations related tasks previously announced date of test writing.

**Seminar:** This week is the preparation of semi-annual week of planning tasks: semi-annual consultations related tasks previously announced date of test writing and building visiting

**9<sup>th</sup> week:**

**Lecture:** Construction: demolition, excavation design, provide support, drainage, foundation

**Seminar:** Size and quantity statement in tabular

form.

**10<sup>th</sup> week:**

**Lecture:** Construction: masonry, plastering, concreting, wood structures, steel structures, transportation, lifting

**Seminar:** Size and quantity statement in a tabular form.

**11<sup>th</sup> week:**

**Lecture:** The budget includes: item systems, overhead hourly rate, job costs, calculating the cost of materials.

**Seminar:** Preparation of budget, computerized by TERC Common laboratory work and building visit

**12<sup>th</sup> week:**

**Lecture:** Preparation of budget, concepts, models.

**Seminar:** Preparation of budget computerized by TERC Common laboratory

**13<sup>th</sup> week:**

**Lecture:** Priced aims

**Seminar:** Preparation of budget computerized by TERC Common laboratory

**14<sup>th</sup> week:**

**Lecture:** The building account

**Seminar:** Building visit

**15<sup>th</sup> week:**

**Lecture:** Production and repair of semi-annual design tasks since semi-annual consultations related tasks previously announced time, classroom and writing plus test this week.

### Requirements

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 labeling and defining technological order.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the 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. Students can't make up any practice with another group. Attendance at practicals will be recorded by the practice leader.. Students have to submit all drawing (a floor plan + section + nodes+cross section+Size and quantity statement in a tabular form) tasks as scheduled minimum on a sufficient level. And a complete budget with technologies. 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 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% For mid-year signature the performance of the task and the acquisition must be more than 50% , and a conditional-release test is necessary. You need to reach 41 points.

Subject: **BRIDGES & STRUCTURES**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Programme The history of bridges The classification of bridges

**Practical:** Standards.

**2<sup>nd</sup> week:**

**Lecture:** Requirements and preliminary works.

**Practical:** Foundations, substructures and equipment; dilatations.

**3<sup>rd</sup> week:**

**Lecture:** The structures of steel bridges. Steel girder bridges.

**Practical:** The building techniques of steel bridges.

**4<sup>th</sup> week:**

**Lecture:** Steel frames, arches and suspension bridges.

**Practical:** Orthotropic plates.

**5<sup>th</sup> week:**

**Lecture:** The structures of concrete bridges.

**Practical:** The building techniques of concrete bridges.

**6<sup>th</sup> week:**

**Lecture:** Concrete girder bridges; concrete frames and arch bridges.

**Practical:** Concrete slab bridges.

**7<sup>th</sup> week:**

**Lecture:** Prestressing techniques. Precast pretensioned girder bridges.

**Practical:** Concrete box girders.

**8<sup>th</sup> week:**

**Lecture:** Structures of cable-stayed bridges.

**Practical:** Building techniques of cable-stayed bridges

**9<sup>th</sup> week:**

**Lecture:** Composite bridges.

**Practical:** Timber bridges.

**10<sup>th</sup> week:**

**Lecture:** Test loading, monitoring and maintenance.

**Practical:** Strengthening techniques.

**11<sup>th</sup> week:**

**Lecture:** Reservoirs, bunkers, water-towers.

**12<sup>th</sup> week:**

**Lecture:** Cases and curiosities

## Requirements

A, for a signature: Attendance and participation at lectures and practicals is compulsory. Students must attend them 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 will be recorded by the lecturer. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. During the semester there is one end-term test. To pass it students have to achieve a minimum (50%) level.

B, for a grade: The course ends in an exam (ESE). Based on the result of the end-term test (30%) and the written exam (70%): Score Grade 0-50 fail (1) 50-62 pass (2) 63-74 satisfactory (3) 75-85 good (4) 85-100 excellent (5) If the score of the test is below 50, students have one chance to write a retake exam.

## Required reading materials

*M. J. Ryall, G. A. R. Parke, J. E. Harding : The Manual of Bridge Engineering*  
Thomas Telford, 2000.

*H. G. Tyrrell : History of Bridge Engineering*  
Stubbe Press, 2008.

## Structural Engineering Compulsory Subjects

Subject: **THEORY OF GIRDERS I**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **1**

Seminar: **2**

### 1<sup>st</sup> week:

**Lecture:** Internal forces for statically determinate structures.

**Seminar:** Internal forces for statically determinate structures.

### 2<sup>nd</sup> week:

**Lecture:** Work theorems – Principles of virtual displacements and forces

**Seminar:** Work theorems

### 3<sup>rd</sup> week:

**Lecture:** Displacements by work theorems.

**Seminar:** Displacements by work theorems.

### 4<sup>th</sup> week:

**Lecture:** Calculation of statically indeterminate structures by the force method, principles, fix loads

**Seminar:** Force methods.

### 5<sup>th</sup> week:

**Lecture:** Application of the force method for grids

**Seminar:** Application of the force method for grids

### 6<sup>th</sup> week:

**Lecture:** Calculation of planar frames by the displacement method, principles

**Seminar:** Rating practice

### 7<sup>th</sup> week:

**Lecture:** Drawing week

**Seminar:** Drawing week

### 8<sup>th</sup> week:

**Lecture:** Mid-term test

**Seminar:** Calculation of planar frames by the displacement method, principles

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Application of the displacement method for planar frames

**Seminar:** Application of the displacement method for planar frames

**10<sup>th</sup> week:**

**Lecture:** Calculation of planar frames by the moment distribution method

**Seminar:** Calculation of planar frames by the moment distribution method

**11<sup>th</sup> week:**

**Lecture:** A cross table formoment distribution.

**Seminar:** A cross table formoment distribution.

**12<sup>th</sup> week:**

**Lecture:** Matrix analysis of planar frames

**Seminar:** Matrix analysis of planar frames

**13<sup>th</sup> week:**

**Lecture:** Drawing week

**Seminar:** Drawing week

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 every class. If a student's behavior 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 tasks as scheduled minimum at a sufficient level. During the semester there are two tests: test 1 in the 8th week and the test 2 in the 15th week. Students have to reach the minimum point level on each test. If the score of any test is below 15 from 30 points, the student once can take a retake test in both topics.

B, for a grade: The course ends in examination grade (ESE). Based on the points of the tasks, tests and the exam. Based on points earned during the semester, 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)

### Required reading materials

*Aslan Kassimali : Structural Analysis*

2014. ISBN: 1133943896

Subject: **THEORY OF GIRDERS II**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Lecture: **1**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Structures in 3D

**Seminar:** Structures in 3D

**2<sup>nd</sup> week:**

**Lecture:** Force and displacement influence lines of statically determinate structures.

**Seminar:** Force and displacement influence lines of statically determinate structures.

**3<sup>rd</sup> week:**

**Lecture:** Force and displacement influence lines of statically determinate structures.

**Seminar:** Force and displacement influence lines

of statically determinate structures.

**4<sup>th</sup> week:**

**Lecture:** Maximal internal forces of cross sections.

**Seminar:** Maximal internal forces of cross sections.

**5<sup>th</sup> week:**

**Lecture:** Diagrams of maximal internal forces.

**Seminar:** Diagrams of maximal internal forces.

**6<sup>th</sup> week:**

**Lecture:** Frames

**Seminar:** Frames

**7<sup>th</sup> week:**

**Lecture:** Trusses

**Seminar:** Trusses

**8<sup>th</sup> week:**

**Lecture:** Mid-term test

**Seminar:** Submitting the task 1.

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Strengthened structures and continuous beams.

**Seminar:** Strengthened structures and continuous beams. Issuing task 2.

**10<sup>th</sup> week:**

**Lecture:** The moment distribution method

**Seminar:** The moment distribution method

**11<sup>th</sup> week:**

**Lecture:** Orthogonal plane frames

**Seminar:** Orthogonal plane frames

**12<sup>th</sup> week:**

**Lecture:** Continuous beams

**Seminar:** Continuous beams

**13<sup>th</sup> week:**

**Lecture:** Calculation of discs using the Airy function

**Seminar:** Consultation

**14<sup>th</sup> week:**

**Lecture:** Theory of thin plates, Navier method

**Seminar:** Consultation

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Seminar:** Submitting task 2.

**Self Control Test**

### Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 every class. If a student's behavior 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 tasks as scheduled minimum at a sufficient level. During the semester there are two tests: test 1 in the 8th week and the test 2 in the 15th week. Students have to reach the minimum point level on each test. If the score of any test is below 15 from 30 points, the student once can take a retake test in both topics.

B, for a grade: The course ends in examination grade (ESE). Based on the points of the tasks, tests and the exam. Based on points earned during the semester, 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)

## Required reading materials

*Budynas: Advanced Strength and Applied Stress Analysis*

2nd.1998. ISBN: 13978-0070089853

*Popov: Mechanics of materials*

ISBN: 978-0135713563

Subject: **BUILDING CONSTRUCTION II**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Wall-type buildings 1.

**Practical:** issuing the task 1 (homework drawing). Elaborating the workshop drawing 1.

**2<sup>nd</sup> week:**

**Lecture:** Wall-type buildings 2.

**Practical:** consultation of task 1 (homework drawing)

**3<sup>rd</sup> week:**

**Lecture:** Wall-type buildings 3.

**Practical:** consultation of task 1 (homework drawing)

**4<sup>th</sup> week:**

**Lecture:** Horizontal load-bearing structures 1.

**Practical:** consultation of task 1 (homework drawing)

**5<sup>th</sup> week:**

**Lecture:** Horizontal load-bearing structures 2.

**Practical:** submitting task 1 (homework drawing). Elaborating workshop drawing 2.

**6<sup>th</sup> week:**

**Lecture:** Horizontal load-bearing structures 3.

**Practical:** Issuing task 2 (homework drawing). Elaborating workshop drawing 3.

**7<sup>th</sup> week:**

**Lecture:** Mid-term test

**Practical:** consultation of task 2 (homework drawing)

**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Pitched roof 1.

**Practical:** consultation of task 2 (homework drawing)

**9<sup>th</sup> week:**

**Lecture:** Pitched roof 2.

**Practical:** consultation of task 2 (homework drawing)

**10<sup>th</sup> week:**

**Lecture:** Pitched roof 3.

**Practical:** submitting task 2 (homework drawing). Issuing task 3 (homework drawing).

**11<sup>th</sup> week:**

**Lecture:** Roof cladding 1.

**Practical:** consultation of task 3 (homework drawing)

**12<sup>th</sup> week:**

**Lecture:** Roof cladding 2.

**Practical:** consultation of task 3 (homework drawing)

**13<sup>th</sup> week:**

**Lecture:** Passive houses 1.

**Practical:** consultation of task 3 (homework drawing)

**14<sup>th</sup> week:**

**Lecture:** Passive houses 2.

**Practical:** submitting task 3 (homework drawing).

**15<sup>th</sup> week:**

**Lecture:** End-term test

**Self Control Test**

## Requirements

Topics: Load bearing structures (walls, frames, floors, stairs, foundation). Wall-type buildings. Load bearing and space-limiting walls. Lintel, ring-beam. Homogeneous and mixed walls. Systems of constructions and buildings (panels and cast wall constructions, frames of reinforced concrete, steel and wood, dry-tech constructions, ready-made buildings). Monolithic RC walls. Partitions. Horizontal load-bearing structures. Dense-rib, floor block, hollow ceramic block, self-form working floors. Comparative evaluation of alternatives. Design principles and rules of floor systems. Balconies. Structures and roofing of pitched roofs, built-in roof spaces. 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 sheet metal covers. Energy balance of buildings: components, geometric ratio and ground plan arrangement of buildings, natural ventilation, energetic requirements, specific heat demand, procedure of energetic design and checking. In seminar there are six tasks to elaborate: 3 homework drawings and 3 workshop drawings.

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 every class. If a student's behavior 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 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 125 points For signature students must achieve more than 50% of points (63 points). B, for a grade: The course ends in an exam (ESE). Mid-semester points: 125 points Colloquium (ESE): 50 points 175 points Score Grade 0-87 fail (1) 88-109 pass (2) 110-131 satisfactory (3) 132-153 good (4) 154-175 excellent (5)

## Required reading materials

*AMBROSE, James E.: Building structures*

Wiley, 1993. ISBN: 0471540609

*BÖHÖNYEY, J.: Building construction encyclopedia*

Iparterv, 1986.

Subject: **DESIGN OF BUILDINGS I**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **1**

Practical: **2**

**1<sup>st</sup> week:**

**Lecture:** Introduction, installation, site concept, content description of a master plan.

**Practical:** First homework- 25 pieces of

furniture, fixtures copying in scale 1:50 M

**2<sup>nd</sup> week:**

**Lecture:** Development of housing premises,

their link to each other, function diagrams.

**Practical:** It's the deadline of the first homework. Analysis of function diagrams

**3<sup>rd</sup> week:**

**Lecture:** Description of housing types, freestanding, semi-detached -terraced houses, house chains, atrium - in terms of integration

**Practical:** Second homework: 5 various built-storied house plans

**4<sup>th</sup> week:**

**Lecture:** Description of a floor plan in residential buildings – function diagrams –such as the boundary, detached, semi-detached houses.

**Practical:** Deadline for the second homework.

**5<sup>th</sup> week:**

**Lecture:** Description of a floor plan in residential buildings – function diagrams- such as the boundary, detached, semi-detached houses.

**Practical:** Design of a residential one-floored house.

**6<sup>th</sup> week:**

**Lecture:** Plan systems of two-storey houses, positioning stages, front height - Interpretation of building height.

**Practical:** Evaluation of the last practice. Third homework. A two-storey house design.

**7<sup>th</sup> week:**

**Lecture:** Two-storey houses plan system, positioning stage, floor plans.

**Practical:** Calculation of building height. 3<sup>rd</sup> homework consultation.

**8<sup>th</sup> week:**

**Lecture:** This week is for preparing the main

project. Consultation in announced appointments. The week of test writing.

**9<sup>th</sup> week:**

**Lecture:** Multi-unit residential building types, corridor-related systems ground floor plans, function diagrams

**Practical:** Consultation

**10<sup>th</sup> week:**

**Lecture:** Corridor-related systems, ground floor plans.

**Practical:** Consultation

**11<sup>th</sup> week:**

**Lecture:** Multi-residential building design, and its problems, parking spaces, common areas, elevators.

**Practical:** Consultation

**12<sup>th</sup> week:**

**Lecture:** Multi-residential building connections, roof types.

**Practical:** Consultation. Signature

**13<sup>th</sup> week:**

**Lecture:** Multi-residential building ground floor plans focus on structure design.

**Practical:** Consultation. Deadline of the 3<sup>rd</sup> homework.

**14<sup>th</sup> week:**

**Lecture:** Facades.

**Practical:** Evaluation for the 3<sup>rd</sup> homework.

**15<sup>th</sup> week:**

**Lecture:** Preparation and correction week for the semi-annual project, consultations only in announced time. The week of the end-term test.

## Requirements

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 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 behavior 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 drawing tasks as scheduled minimum at a sufficient level. Students have to earn at least 38 points during the semester for signing and examination. That's minimum of the half-year performance.

B, for a grade: Mid-semester (AW5) : Homework 1 and 2:  $2 \times 5 = 10$  points (min.  $2 \times 3 = 6$  pont) Homework 3:  $1 \times 30 = 30$  points (min.  $1 \times 16 = 16$  pont) Practise 1-3:  $3 \times 10 = 30$  pont ( min.  $3 \times 6 = 18$  pont) The condition of the signature, and the exam-release is the performance, which have to be more than 50%, min. 40 points. Score Grade 0 - 39 1 (fail) 40 - 47 2 (pass) 48 - 54 3 (satisfactory) 55 - 62 4 (good) 63 - 70 5 (excellent) It is necessary to retake every unsatisfactory performance. (exam, research, project) If the written exam does not exceed the 50%, it is mandatory to retake the exam, repeat all the elements within it.

### Required reading materials

*Malcolm Millais: Building structures*

*Philip Garrison: Basic Structures for Engineers and Architects*

*Ernst Neufert: Architects' data*

*Jürgen Adam, Katharina Hausmann, Frank Jüttern: Industrial Buildings*

Subject: **STEEL STRUCTURES II**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **1**

#### 1<sup>st</sup> week:

**Lecture:** Preparation, description of subject requirements, course schedule descriptions, describing of the course literature list, registration week.

#### 2<sup>nd</sup> week:

**Lecture:** Different forms of steel structures. Ductile properties of kinds of steel material. Material models.  
**Seminar:** Outgiving and discussion of design tasks.

#### 3<sup>rd</sup> week:

**Lecture:** Taking into account the secondary effects on steel structures.  
**Seminar:** Controlling the sketch plan and the load combinations.

#### 4<sup>th</sup> week:

**Lecture:** Classification of structural elements under compression and bending. Calculating the resistance of structural elements under

compression and bending.

**Seminar:** Classification of structural elements of the design task. Calculating the resistance of the structural elements.

#### 5<sup>th</sup> week:

**Lecture:** Calculating the resistance of structural elements under simultaneous compression and bending.  
**Seminar:** Example tasks on calculating the resistance of structural elements under simultaneous compression and bending.

#### 6<sup>th</sup> week:

**Lecture:** Design of split-section bars.  
**Seminar:** Example tasks on calculating the resistance of split-section bars.

#### 7<sup>th</sup> week:

**Lecture:** Design of steel frame structures.  
**Seminar:** Consultation



**8<sup>th</sup> week:**

**Lecture:** TEST1  
**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Construction and resistance of end-plate connections.  
**Seminar:** Example tasks on calculating the resistance of end-plate connections.

**10<sup>th</sup> week:**

**Lecture:** Stiffness of end-plate connections.  
**Seminar:** Example tasks on calculating the stiffness of end-plate connections.

**11<sup>th</sup> week:**

**Lecture:** Simplified design of end-plate connections.  
**Seminar:** Example tasks on using the simplified design of end-plate connections.

**12<sup>th</sup> week:**

**Lecture:** Stiffness of joints. Categorization. Design of structures with semi-rigid joints.  
**Seminar:** Example tasks on calculating the resistance of split-section bars.

**13<sup>th</sup> week:**

**Lecture:** Fatigue and brittle fracture of steel structures.  
**Seminar:** Consultation.

**14<sup>th</sup> week:**

**Lecture:** TEST2  
**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Consultation.  
**Seminar:** Consultation. Handing in of the Design Task

### Requirements

Attendance at lectures is strongly recommended, but not compulsory. Participation at practice class is compulsory. Students must attend the practicals 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 at practicals 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 practices should be made up for at a later date, being discussed with the tutor. Students are required to bring the calculator and the printed materials of the lectures 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 and the design task 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 14th week – and there is a design task. In order to get the signature, minimum point of test and design task has to be taken (min. 50 points from 80 points). In order to get an exam grade (ESE) – minimum (2) pass grade – minimum point of tests and design tasks as well as exam 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 following: Two tests: Test I: Maximum: 20 points Minimum: 12 points Test II: Maximum: 20 points Minimum: 12 points Summa: 40 points 24 points Design task: Maximum: 40 points Minimum: 26 points Points required for sign: Maximum: 80 points Minimum: 50 points (In case of having min. 50 points from the Tests and from the Design Tasks, sign can be obtained) Exam: Maximum: 20 points Minimum: 11 points Summa points: Maximum: 100 points Minimum: 61 points The course ends in an exam grade (ESE). Based on the summa points of the tests, the summa points of the design tasks and the summa points 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)

### Required reading materials

*Eurocode: Basis of structural design*

EN 1990:2002/A1:2005 .

*Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

EN 1991-1-1:2002 .

*MSZ: Design of steel structures Part 1-1.:General rules and rules for buildings*

EN 1993-1-1: 2009 .

*Eurocode 3: Design of steel structures - Part 1-8: Design of joints*

EN 1993-1-8:2005.

Subject: **STEEL STRUCTURES III**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Preparation, description of subject requirements, course schedule description, description of the course literature lists, registration week. Short summary of the previously discussed problems of steel structures.

**2<sup>nd</sup> week:**

**Lecture:** Fabrication and construction technologies of steel structures.

**3<sup>rd</sup> week:**

**Lecture:** The most commonly used welding technologies constructing steel structures.

**Seminar:** Outgiving and discussion of the design task.

**4<sup>th</sup> week:**

**Lecture:** Presentation of different steel based construction systems, Chapter I: Lindab System.

**Seminar:** Using of the Lindab Design Guidelines in practice

**5<sup>th</sup> week:**

**Lecture:** Presentation of different steel based construction systems, Chapter II: Lindab

**Seminar:** Usage of the Lindab Design Guidelines in practice

**6<sup>th</sup> week:**

**Lecture:** Presentation of different steel based construction systems, Chapter III: Astron System.

106

**Seminar:** Usage of the Astron Design Guidelines in practice. Consultation.

**7<sup>th</sup> week:**

**Lecture:** Special design problems of welded steel girders I.

**Seminar:** Design examples for welded steel girders I.

**8<sup>th</sup> week:**

**Lecture:** TEST1

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Special design problems of welded steel girders II.

**Seminar:** Design example for welded steel girders II.

**10<sup>th</sup> week:**

**Lecture:** Classifications and types of steel struts I.

**Seminar:** Design of steel struts. Different design examples for steel struts I.

**11<sup>th</sup> week:**

**Lecture:** Classifications and types of steel struts II.

**Seminar:** Design of steel struts. Different design examples for steel struts II.

**12<sup>th</sup> week:**

**Lecture:** Industrial visit I – Visit at a

prefabrication industry.

**13<sup>th</sup> week:**

**Lecture:** Industrial visit II – Visit at a steel portal hall

**14<sup>th</sup> week:**

**Lecture:** TEST2

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Consultation.

**Seminar:** Consultation. Handing in of the Design Task

### Requirements

Topics: Portal frames. Typical arrangement of portal frames. Imperfection. Load effects of frames. Elastic and plastic global analysis of frames. Design of members (cross-section resistance, member buckling resistance). Design of joints. Truss structures. Typical arrangement of truss structures. Hollow section joints, types of joints in hollow sections. Failures for hollow section joints. Welded joints between CHS members. Welded joints between CHS or RHS brace members and RHS chord members. Welded joints between CHS or RHS brace members and I or H section chords. Welded joints between CHS or RHS brace members and channel section chord members.

Attendance at lectures is strongly recommended, but not compulsory. Participation at practice is compulsory. Students must attend practicals 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 lectures and practicals 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 practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures to each lecture and practice class. Active participation is evaluated by the teacher every class. Students' active participation is required.

Students have to submit all the two tests and the design task 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 14th week – and there is a design task. In order to get the signature, the minimum points of test and design task have to be taken (min. 50 points of 80 points). In order to take an exam grade – minimum (2) pass grade – minimum points of tests and design tasks as well as exam points have to be taken (Summa minimum 61 points of 100 points). The minimum and the maximum points related to the tests and the design task can be obtained are the following: Two tests: Test I: Maximum: 20 points Minimum: 12 points Test II: Maximum: 20 points Minimum: 12 points Summa: 40 points 24 points Design task: Maximum: 40 points Minimum: 26 points Points required for a signature: Maximum: 80 points Minimum: 50 points (In case of having min. 50 points from the Tests and from the Design Task, signature can be obtained) Exam: Maximum: 20 points Minimum: 11 points Summa points: Maximum: 100 points Minimum: 61 points The course ends in an exam grade. Based on the summa points of the tests, the summa points of the design task and the summa point of the exam, the exam 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)

### Required reading materials

*Eurocode: Basis of structural design*

EN 1990:2002/A1:2005 .

*MSZ: Design of steel structures Part 1-1.:General rules and rules for buildings*

EN 1993-1-1: 2009 .

*Eurocode 3: Design of steel structures - Part 1-8: Design of joints*  
EN 1993-1-8:2005.

*Eurocode 1 EN 1991-1-1:2002 : Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

*Design of Steel Portal Frames for Europe*

University of Edinburgh, 2011.

Subject: **REINFORCED CONCRETE STRUCTURES II**

Year, Semester: 3<sup>rd</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **1**

**1<sup>st</sup> week:**

**Lecture:** Theory of elastic slabs. Loads and stresses of elastic slabs. Differential equation of elastic slabs. One and two way slabs. Examples for one-way and two-way RC slabs. Outgiving and discussion of the 1<sup>st</sup> Design Task.

**Practical:** Outgiving and discussion of the 1<sup>st</sup> Design Task.

**2<sup>nd</sup> week:**

**Lecture:** Approximate solutions of slabs, Marcus type solutions, FEM methods. Further examples for one-way and two-way RC slabs. Outgiving and discussion of the 2<sup>nd</sup> Design Task.

**Practical:** Outgiving and discussion of the 2<sup>nd</sup> Design Task.

**3<sup>rd</sup> week:**

**Lecture:** Design and reinforcement details of one-way and two-way slabs by the usage of individual steel bars, reinforcement Examples for one-way and two-way RC slab design.

**Practical:** Outgiving and discussion of the 3<sup>rd</sup> Design Task.

**4<sup>th</sup> week:**

**Lecture:** Design and reinforcement details of one-way and two-way slabs by the usage of welded steel meshes. Examples for one-way and two-way RC slab design.

**Practical:** Outgiving and discussion of the 4<sup>th</sup> Design Task.

**5<sup>th</sup> week:**

**Lecture:** Complex design of RC slabs I. (One

way type) / Laboratory practice.

**6<sup>th</sup> week:**

**Lecture:** Complex design of RC slabs II. (Two way type) / Laboratory practice.

**7<sup>th</sup> week:**

**Lecture:** 1<sup>st</sup> Test

**Practical:** Hand in of the 1<sup>st</sup> Design Task Hand in of the 2<sup>nd</sup> Design Task

**Self Control Test**

**8<sup>th</sup> week:**

**Lecture:** Classification of flat slabs. Design approaches for flat slabs. Reinforcement layout of flat slabs.

**Practical:** Outgiving and discussion of the 5<sup>th</sup> Design Task.

**9<sup>th</sup> week:**

**Lecture:** Shearing in flat slabs. Punching shear of flat slabs. Design of punching shear reinforcement, detail of punching shear reinforcement. Examples for punching shear design.

**10<sup>th</sup> week:**

**Lecture:** Plastic analysis of reinforced concrete struts. Static and kinematic methods for determining the plastic capacity of RC cross sections. Plastic hinge. Examples for determination of plastic capacity.

**11<sup>th</sup> week:**

**Lecture:** Plastic analysis of reinforced concrete slabs. Yield line theory. Application of static and

kinematic methods for RC slabs. Examples for the determination of the plastic capacity of slabs.

**Practical:** Outgiving and discussion of the 6<sup>th</sup> Design Task. Outgiving and discussion of the 7<sup>th</sup> Design Task. Handing in of the 6<sup>th</sup> Design Task. Handing in of the 7<sup>th</sup> Design Task

**12<sup>th</sup> week:**

**Lecture:** Plastic analyses of reinforced concrete slabs II. Two-way and flat slab analysis. Examples for plastic capacity determination of slabs.

**13<sup>th</sup> week:**

**Practical:** Selected design problems of the plastic capacity of RC struts and RC slabs I.

**14<sup>th</sup> week:**

**Practical:** Selected design problems of the plastic capacity of RC struts and RC slabs II. Hand in of the 5<sup>th</sup> Design Task

**15<sup>th</sup> week:**

**Lecture:** 2<sup>nd</sup> Test

**Practical:** Hand in of the 6<sup>th</sup> Design Task. Hand in of the 7<sup>th</sup> Design Task

**Self Control Test**

### Requirements

Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 lectures and at practicals will be recorded by the staff of the department. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures to each lecture and practice class. 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 seven design tasks as scheduled minimum at a sufficient level. During the semester there are two tests – the 1st test in the 7th week and the 2nd test in the 15th week – and there are seven design tasks. In order to get the signature, minimum points of tests and design tasks have to be taken (min. 50 points from 80 points). In order to take an exam grade (ESE) – minimum (2) pass grade – minimum points of tests and design tasks as well as exam points have 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 following: Two tests: Test I: Maximum: 15 points Minimum: 9 points Test II: Maximum: 15 points Minimum: 9 points Summa: 30 points 18 points Seven design tasks: Design Task 1: Maximum: 5 points Minimum: 3 points Design Task 2: Maximum: 10 points Minimum: 7 points Design Task 3: Maximum: 5 points Minimum: 3 points Design Task 4: Maximum: 10 points Minimum: 7 points Design Task 5: Maximum: 15 points Minimum: 9 points Design Task 6: Maximum: 2 points Minimum: 1 points Design Task 7: Maximum: 3 points Minimum: 2 points Summa: 50 points 32 points Points required for signature: Maximum: 80 points Minimum: 50 points (In case of having min. 50 points of the Tests and of the Design Tasks, signature can be obtained) Exam: Maximum: 20 points Minimum: 11 points Summa points: Maximum: 100 points Minimum: 61 points The course ends in an exam grade (ESE). Based on the summa points of the tests, the summa points of the design tasks 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)

### Required reading materials

*fib Bulletin 51 Structural Concrete : Textbook on behavior, design and performance*

2nd - Volume 1. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883  
*fib Bulletin 52 Structural Concrete : Textbook on behavior, design and performance*  
 2nd - Volume 2. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883  
*fib Bulletin 53 Structural Concrete : Textbook on behavior, design and performance*  
 2nd - Volume 3. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883  
*fib Bulletin 54 Structural Concrete : Textbook on behavior, design and performance*  
 2nd – Volume 4. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883  
*fib Bulletin 62 Structural Concrete : Textbook on behavior, design and performance*  
 2nd – Volume 5. Federation International du Béton , 2012. ISBN: 1562-3610, 978-2-883  
*Eurocode EN 1990:2002/A1:2005 : Basis of structural design*  
*Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*  
 2. EN 1991-1-1:2002 .  
*MSZ: Design of concrete structures Part 1-1.: General rules and rules for buildings*  
 EN 1992-1-1: 2010 .  
*MSZ: Design of concrete structures Part 1-2: General rules. Structural fire design*  
 EN 1992-1-2: 2010 .  
*MSZ: Concrete Part 1: Specification, performance production, conformity, and rules of application of MSZ*  
 4798-1:2004. EN 206-1 in Hungary,

Subject: **REINFORCED CONCRETE STRUCTURES III**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Lecture: **2**

Practical: **1**

**1<sup>st</sup> week:**

**Lecture:** Shear between web and flange of T section. Shear transfer between different time concrete. Design examples for T beams.

**Practical:** Outgiving and discussion of the 1<sup>st</sup> Design Task.

**2<sup>nd</sup> week:**

**Lecture:** Torsion of concrete and reinforced concrete sections. Interaction of shear and torsion. Interaction of bending moment, shear and torsion. Examples.

**3<sup>rd</sup> week:**

**Lecture:** Effects of normal force on RC cross-section. The method of ultimate force and ultimate eccentricity. Moment – normal force interaction curves for in-plane and for out-plane situations. Examples.

**Practical:** Outgiving and discussion of the 2<sup>nd</sup> Design Task.

**4<sup>th</sup> week:**

**Lecture:** Types, loads, classification and design considerations for RC columns. Braced and unbraced columns. Eccentricities, imperfections, second order effects. Design possibilities of RC columns.

**5<sup>th</sup> week:**

**Lecture:** Loads and stresses of RC frames. Approximate determination of frame loads for vertical and horizontal loads. (I.)  
**Practical:** Outgiving and discussion of the 3<sup>rd</sup> Design Task. Handing in of the 1<sup>st</sup> Design Task. Handing in of the 2<sup>nd</sup> Design Task

**6<sup>th</sup> week:**

**Lecture:** Loads and stresses of RC frames. Approximate determination of frame loads for vertical and horizontal loads. (II.)

**7<sup>th</sup> week:**

**Lecture:** Beam and disturb zones and joints of

RC frames, Analyses of different types of frame corners.

**8<sup>th</sup> week:**

**Lecture:** Test I

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Beam and disturbing zones and joints of RC frames, Analyses of corbels, half-end beams.

**Practical:** Handing in of the 3<sup>rd</sup> Design Task

**10<sup>th</sup> week:**

**Lecture:** Reinforced concrete walls. Loads and design of reinforced concrete walls. Special problems of under reinforced structures subjected normal force. Examples.

**Practical:** Outgiving and discussion of the 4<sup>th</sup> Design Task.

**11<sup>th</sup> week:**

**Lecture:** Elastic analysis of in-plane structures – in-plane stresses and in-plane displacements.

**12<sup>th</sup> week:**

**Lecture:** Elastic analysis of reinforced concrete deep beams and shear walls. Examples.

**Practical:** Outgiving and discussion of the 5<sup>th</sup> Design Task.

**13<sup>th</sup> week:**

**Lecture:** : Plastic analysis of reinforced concrete walls, shear walls and deep beams by strut-and-tile models. Examples.

**14<sup>th</sup> week:**

**Practical:** Examples for different types of in-plane RC structures.

**15<sup>th</sup> week:**

**Lecture:** Test II

**Practical:** Handing in of the 3<sup>rd</sup> Design Task.

Handing in of the 4<sup>th</sup> Design Task. Handing in of the 5<sup>th</sup> Design Task

**Self Control Test**

### Requirements

Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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 lectures and at practicals will be recorded by the staff of the department. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures to each lecture and practice class. 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. During the semester there are two tests – the 1st test in the 7th week and the 2nd test in the 15th week – and there are seven design tasks. In order to get the signature, minimum points of tests and design tasks have to be taken (min. 50 points from 80 points). In order to take an exam grade (ESE) – minimum (2) pass grade – minimum points of tests and design tasks as well as exam points have 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 following: Two tests: Test I: Maximum: 15 points Minimum: 8 points Test II: Maximum: 15 points Minimum: 8 points Summa: 30 points 16 points Five design tasks: Design Task 1: Maximum: 15 points Minimum: 11 points Design Task 2: Maximum: 7 points Minimum: 4 points Design Task 3: Maximum: 15 points Minimum: 11 points Design Task 4: Maximum: 6 points Minimum: 4 points Design Task 5: Maximum: 7 points Minimum: 4 points Summa: 50 points 34 points Points required for a signature: Maximum: 80 points Minimum: 50 points (In case of having min. 50 points from the Tests and from the Design Tasks, signature can be obtained) Exam: Maximum: 20 points Minimum: 11 points Summa points:

Maximum: 100 points Minimum: 61 points The course ends in an exam grade (ESE). Based on the summa points of the tests, the summa points of the design tasks 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)

### Required reading materials

*fib Bulletin 51 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 1. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883

*fib Bulletin 52 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 2. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883

*fib Bulletin 53 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 3. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883

*fib Bulletin 54 Structural Concrete : Textbook on behavior, design and performance*  
2nd – Volume 4. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883

*fib Bulletin 62 Structural Concrete : Textbook on behavior, design and performance*  
2nd – Volume 5. Federation International du Béton , 2012. ISBN: 1562-3610, 978-2-883

*Eurocode EN 1990:2002/A1:2005 : Basis of structural design*

*MSZ: Design of concrete structures Part 1-1.: General rules and rules for buildings*  
EN 1992-1-1: 2010 .

*Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*  
EN 1991-1-1:2002 .

Subject: **GEOTECHNICS IV**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** Failure investigations in Geo technical Engineering. Surveying and recording the damages, cracks. Planning of instrumentation, and analyzing their data.

**2<sup>nd</sup> week:**

**Lecture:** Recommendations and design for the restoration. Technologies used for reenforcing the foundation of a damaged building.

**3<sup>rd</sup> week:**

**Lecture:** In-ground retaining structures. Brief history of embedded retaining wall design. Embedded walls. Effects of soil/wall friction and adhesion.

**4<sup>th</sup> week:**

**Lecture:** Clay soils. Time-scale over which

undrained conditions apply. Effect of high in situ lateral stress.

**5<sup>th</sup> week:**

**Lecture:** Calculation of bending moments and prop loads. Geostructural mechanism to estimate wall-movements. The effect of wall stiffness.

**6<sup>th</sup> week:**

**Lecture:** Analysis and design of shallow underground structures. Design and construction of underground engineering structures in urban area.

**7<sup>th</sup> week:**

**Lecture:** Midterm Test  
**Self Control Test**



**8<sup>th</sup> week:**

**Lecture:** Introduction to tunnels. Tunnel construction. Bored tunnels in soft ground - method of construction.

**9<sup>th</sup> week:**

**Lecture:** Type of shield for tunneling. Stress changes near tunnels. Stability of tunnel headings for undrained and drained loading.

**10<sup>th</sup> week:**

**Lecture:** Stress analysis of a tunnel of circular cross-section. Collapse of tunnels in clay (short term total stress analysis). Collapse of tunnels - effective stress analysis

**11<sup>th</sup> week:**

**Lecture:** Ground movements due to tunneling. Load factor to limit ground movements.

**12<sup>th</sup> week:**

**Lecture:** Influence of water on tunnels. Environmental aspects of underground structures.

**13<sup>th</sup> week:**

**Lecture:** Design and construction of bored tunnels and pipes under existing road and railway lines. Supporting walls and presses.

**14<sup>th</sup> week:**

**Lecture:** End of Semester Test

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Make-up tests (End of Semester).

**Self Control Test**

### Requirements

**Topics:** This is an introductory class to the design and the construction of the underground engineering structures, including embedded retaining wall, underground garage, and tunnels. Failure investigations in Geo technical Engineering and special foundations used for reinforcing damaged structures are also covered briefly. By the end of this course, the student should have: An overall knowledge and understanding of the design and the construction aspects of in-ground retaining structures. Text: Lecture notes will be available.

**Attendance:** Participation in lectures is critical to successful completion of this course. More than 5 unexcused absences result in no completion of the course. Completion of the course: D or higher grades for both tests. There is one make up test for each. Grading of tests: Score Grade 0-60 (F) fail (1) 61-70 (D) pass (2) 71-80 (C) satisfactory (3) 81-90 (B) good (4) 91-100 (A) excellent (5) Grading of the course: Mid term Test 25% End of semester Test 25% Exam 50% Verbal 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 in the Neptune.

### Required reading materials

*Utsav Chandra Kalita : Soil Mechanics & Foundation Engineering*  
PHI Learning Pvt. , 2011.

*Károly Széchy : The art of tunneling*  
Akadémiai Kiadó, 1996.

*Sahashi K. Gulhati, Sahashi K Gulhati Manoj Datta : Geotechnical Engineering*  
McGraw-Hill Education, 2005.

Subject: **CONSTRUCTION MANAGEMENT II**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Lecture: **1**

Seminar: **2**

**1<sup>st</sup> week:**

**Lecture:** Preparation, Course-up, presenting academic requirements, course schedule description, description of subject bibliography, registration week

**2<sup>nd</sup> week:**

**Lecture:** Spatial organization: Site Buildings, structures, roads. Energy and utilities board.  
**Seminar:** Case task 1. Calculation of Working Time Standards Collecting and spending time laboratory work using the TERC

**3<sup>rd</sup> week:**

**Lecture:** Spatial organization: storage of building materials and products. Internal mass transport.  
**Seminar:** Preparation of construction and substructure work.

**4<sup>th</sup> week:**

**Lecture:** Spatial organization: the auxiliary. Creating spatial organizational plans  
**Seminar:** Constructional work.

**5<sup>th</sup> week:**

**Lecture:** Time management: Concepts. Types of rate plans. Portrayal of the Schedule.  
**Seminar:** Kinds of roof and interior finishing work.

**6<sup>th</sup> week:**

**Lecture:** Time scheduled basic elements: training processes. Analyses of processes: process of time and labor expenses. The combination of processes (determine relative time positions).  
**Seminar:** Facades and outdoor finishing work +building visit.

**7<sup>th</sup> week:**

**Lecture:** The time scheduled basic elements: The mesh design - critical path. A continuous band-like construction management, construction management. Technology-based construction management (business management  
**Seminar:** Staff and equipment schedule. Organizational technical description+building

visit

**8<sup>th</sup> week:**

**Lecture:** Basic elements of the schedule: The recommended process of planning time. The time scheduled update. Standard data.  
**Seminar:** Case 1. administration tasks

**10<sup>th</sup> week:**

**Lecture:** 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.  
**Seminar:** Picking material. Select Timing Machine auxiliary.

**11<sup>th</sup> week:**

**Lecture:** Workspace delivery and the receipt of a report in the way of finishin.  
**Seminar:** A small practical exercise in small group handover.

**12<sup>th</sup> week:**

**Lecture:** Implementation - organizing implementation. Building log and diary survey, What is what, when to use it?  
**Seminar:** Requirements of a building plant room (social spaces, warehouses ...) Practical examples are included) Afternoon diary entries through an example; answers, comments, deadlines)

**13<sup>th</sup> week:**

**Lecture:** The transfer - technical work handover.  
**Seminar:** Temporary utilities (water, sewer, electricity ...)

**14<sup>th</sup> week:**

**Lecture:** Operation. Aftercare - post-transfer tasks.  
**Seminar:** Administration task 2

**15<sup>th</sup> week:**

**Lecture:** Production and repair of semi-annual design tasks since semi-annual consultations related tasks previously announced time, classroom and writing plus test this week

## Requirements

Topics: 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!

A, for a signature: Attendance at lectures is recommended, but not compulsory. Participation at practicals is compulsory. Students must attend the practicals 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.

Subject: **FEM MODELLING I**

Year, Semester: 3<sup>rd</sup> year/2<sup>nd</sup> semester

Seminar: 4

**1<sup>st</sup> week:**

**Seminar:** The FEM method.

**2<sup>nd</sup> week:**

**Seminar:** Presentation of the features of an applied FEM software.

**3<sup>rd</sup> week:**

**Seminar:** Modeling simple structures as a beam, cantilever.

**4<sup>th</sup> week:**

**Seminar:** Modeling a truss girder in plane.

**5<sup>th</sup> week:**

**Seminar:** Modeling a steel frame in plane.

**6<sup>th</sup> week:**

**Seminar:** Modeling a steel hall building in 3D – first order structures.

**7<sup>th</sup> week:**

**Seminar:** Modeling a steel hall building in 3D – second order structures.

**8<sup>th</sup> week:**

**Seminar:** Modeling of timber roof structures in 2D.

**9<sup>th</sup> week:**

**Seminar:** Modeling of complex timber roof structures in 3D.

**10<sup>th</sup> week:**

**Seminar:** Modeling of a simple concrete slab.

**11<sup>th</sup> week:**

**Seminar:** Modeling of a concrete slab, supported with beams and columns.

**12<sup>th</sup> week:**

**Seminar:** Modeling of a concrete a staircase with elevator shaft. Modeling of a concrete pool.

**13<sup>th</sup> week:**

**Seminar:** Modeling of structures with dynamic loads.

**14<sup>th</sup> week:**

**Seminar:** Special features of the program.

**15<sup>th</sup> week:**

**Seminar:** Retaking of tasks.

### Requirements

A, for a signature: Participation at practicals is compulsory. Students must attend the practicals 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 behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate her/his participation as an absence due to the lack of active participation in class. Students have to upload models on the online education surface every week from the third week. Five chosen models will be rated at the end of the semester. If the score of any model is below 10 from 20, the student can repeat modeling that structure in the last week of the semester.

B, for a grade: The course ends in a mid-term grade (AW5), based on the points of the tasks. Based on points earned during the semester, 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)

### Required reading materials

*BOJTÁR I., GÁSPÁR Zs.: The finite element method for engineers*  
Terc, 2003.

*ZIENKIEWICZ O.C., TAYLOR R.L.: The finite element method I*  
Butterworth-Heinemann, 2000. ISBN: 0 7506 6320 0

*BELYTSSCHKO T., LIU W.K., MORAN B.: Nonlinear finite elements for continua and structures*  
John Wiley, 2000. ISBN: 0 471 98774 3

*Guide of the AXIS-VM program*

URL: <http://www.axisvm.co.uk/up-demo-docs/English/Documents/manual11.pdf>

Subject: **STRUCTURAL ENGINEERING FINAL EXAM**

Year, Semester: 4<sup>th</sup> year/2<sup>nd</sup> semester

## Structural Architect Specialization

Subject: **STEEL BUILDINGS**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: **2**

Seminar: **1**

**1<sup>st</sup> week:**

**Lecture:** Preparation, description of subject requirements, course schedule description,

description of the course literature list, registration week.

**2<sup>nd</sup> week:**

**Lecture:** Type and classification of steel buildings. Outgiving and discussion of the design task.

**Seminar:** Outgiving and discussion of the design task.

**3<sup>rd</sup> week:**

**Lecture:** Bracing systems of steel frames. Fixed column foots.

**Seminar:** Detailing of steel structures.

**4<sup>th</sup> week:**

**Lecture:** Classifications and types of steel struts used in steel buildings I.

**Seminar:** Loads and forces of the bracing system.

**5<sup>th</sup> week:**

**Lecture:** Classifications and types of steel struts used in steel buildings II.

**Seminar:** Detailing of the struts and their joints.

**6<sup>th</sup> week:**

**Lecture:** Design and special problems of steel crane girders.

**Seminar:** Examples for design of crane girders.

**7<sup>th</sup> week:**

**Lecture:** Design and special problems of quilt girders.

**Seminar:** Design example for a quilt girder.

**8<sup>th</sup> week:**

**Lecture:** TEST1

**Self Control Test**

**9<sup>th</sup> week:**

**Lecture:** Classification and types of the thin-wall steel structures.

**Seminar:** Calculation and details of thin-wall structures.

**10<sup>th</sup> week:**

**Lecture:** Special problems of cross section class IV.

**Seminar:** Design of CSC IV.

**11<sup>th</sup> week:**

**Lecture:** Some special problems of steel-concrete composite structures.

**Seminar:** Design examples for simple composite girders.

**12<sup>th</sup> week:**

**Lecture:** Fatigue of steel structures. Problems of the brittle fracture. Fire resistance of steel structures.

**Seminar:** Simplified design examples for checking fire resistance.

**13<sup>th</sup> week:**

**Lecture:** Case studies for steel structures, steel buildings.

**14<sup>th</sup> week:**

**Lecture:** TEST2

**Self Control Test**

**15<sup>th</sup> week:**

**Lecture:** Consultation.

**Seminar:** Consultation. Handing in of the Design Task

## Requirements

Topics: Classification and types of steel buildings. Bracing systems of steel buildings. Special steel struts in steel buildings. Detailing of steel frames and struts. Design of steel crane girders. Design of steel quilt structures. Classification, types and design problems of thin-wall structural elements. Cross section class IV. Some problems of the steel-composite structures used in steel buildings. Fatigue, brittle fracture and fire resistance of steel structures. Case studies.

Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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 lectures and at practicals will be recorded by the staff of the department. Being late is equivalent with an absence.

In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures 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 and one design task 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 14th week – and there is a design task. In order to get the signature, the minimum points of the tests and the design task have to be taken (min. 50 points of 80 points). In order to take an exam grade (ESE) – minimum (2) pass grade – minimum points of tests and the design task as well as exam points have to be taken (Summa minimum 61 points of 100 points). The minimum and the maximum points related to the tests and the design task can be obtained are the following: Two tests: Test I: Maximum: 20 points Minimum: 12 points Test II: Maximum: 20 points Minimum: 12 points Summa: 40 points 24 points Design task: Maximum: 40 points Minimum: 26 points Points required for sign: Maximum: 80 points Minimum: 50 points (In case of having min. 50 points for the Tests and for the Design Task, signature can be obtained) Exam: Maximum: 20 points Minimum: 11 points Summa points: Maximum: 100 points Minimum: 61 points The course ends in an exam grade (ESE). Based on the summa points of the tests, the summa points of the design task 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)

### Required reading materials

*Eurocode EN 1990:2002/A1:2005 : Basis of structural design*

*Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

EN 1991-1-1:2002 .

*Eurocode 3: Design of steel structures - Part 1-8: Design of joints*

EN 1993-1-8:2005.

*MSZ: Design of steel structures Part 1-1.:General rules and rules for buildings*

EN 1993-1-1: 2009 .

*Design of Steel Portal Frames for Europe*

University of Edinburgh, 2011.

Subject: **REINFORCED CONCRETE BUILDINGS**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: **2**

Practical: **1**

#### 1<sup>st</sup> week:

**Lecture:** Classification of reinforced concrete high buildings. Special loads of high rise reinforced concrete buildings. Bracing systems of high rise buildings.

#### 2<sup>nd</sup> week:

**Lecture:** Determination of loads and stresses of the bracing systems of high rise reinforced concrete buildings. Examples.

#### 3<sup>rd</sup> week:

**Practical:** Examples for static analysis of different bracing systems of high rise buildings. Outgiving and discussion of the 1<sup>st</sup> Design Task.

#### 4<sup>th</sup> week:

**Lecture:** Special aspects of precast concrete and precast reinforced concrete. Safety factors, concrete strength, effects of the industrial area.

Examples.

**5<sup>th</sup> week:**

**Lecture:** Prestressing technologies. Prestressing force loss of prestressing, effective prestressing forces.

**6<sup>th</sup> week:**

**Lecture:** Design of pressed members. Magnel lines. Ultimate moment capacity according to Mörsch. Effects of prestressing on shear. Outgiving and discussion of the 2<sup>nd</sup> Design Task.

**7<sup>th</sup> week:**

**Lecture:** Postensioning technologies. Special problems of the postensioned structures. Design aspects and problems of the statically determined and undetermined structures.

**8<sup>th</sup> week:**

**Lecture:** 1<sup>st</sup> Test. Handing in of the 1<sup>st</sup> Design Task. Handing in of the 2<sup>nd</sup> Design Task

**9<sup>th</sup> week:**

**Lecture:** Reinforced concrete footings I. Design

of footings. Examples. Outgiving and discussion of the 3<sup>rd</sup> Design Task.

**10<sup>th</sup> week:**

**Lecture:** Reinforced concrete footings II. Design of footings. Examples. Outgiving and discussion of the 4<sup>th</sup> Design Task.

**11<sup>th</sup> week:**

**Lecture:** Reinforced concrete footings III. Design of footings. Examples. Outgiving and discussion of the 5<sup>th</sup> Design Task.

**12<sup>th</sup> week:**

**Lecture:** Types, properties, applications and design aspects of different kind of fibre reinforced concrete.

**13<sup>th</sup> week:**

**Lecture:** Fire resistance of reinforced concrete structures, design for fire.

**14<sup>th</sup> week:**

**Lecture:** Industrial visit.

### Requirements

Topics: Reinforced concrete buildings. Monolithic and prefabricated systems: structural elements of RC frames and RC halls. Bracing systems of tall buildings. Reinforced concrete constructions: forming of dilatations, forming of structural joints, structural elements for thermal, voice and water isolations as well as vibrations, connection of prefabricated RC members. Special design problems of construction of prefabricated elements: connections of monolithic and prefabricated elements, details of joints. Design considerations for the main formwork types. Effects of fire on RC structures, structural fire design.

Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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 lectures and practicals will be recorded by the staff of the department. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures to each lecture and practice class. Active participation is evaluated by the teacher in every class. Active student's participation should be required during lectures as well as practicals. Students have to submit all the two tests and the five design 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 are five design tasks. In order to get the signature, minimum point of tests and design tasks has to be taken (min. 50 points of 80 points). In order to take an exam grade – minimum (2) pass grade – minimum point of the tests and the design tasks as well as exam points

have 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 following: Two tests: Test I: Maximum: 15 points Minimum: 8 points Test II: Maximum: 15 points Minimum: 8 points Summa: 30 points 16 points Five design tasks: Design Task 1: Maximum: 8 points Minimum: 5 points Design Task 2: Maximum: 15 points Minimum: 11 points Design Task 3: Maximum: 9 points Minimum: 6 points Design Task 4: Maximum: 9 points Minimum: 6 points Design Task 5: Maximum: 9 points Minimum: 6 points Summa: 50 points 34 points Points required for a signature: Maximum: 80 points Minimum: 50 points (In case of having min. 50 points from the Tests and from the Design Tasks, a signature can be obtained) Exam: Maximum: 20 points Minimum: 11 points Summa points: Maximum: 100 points Minimum: 61 points The course ends in an exam grade (AW5). Based on the summa points of the tests, the summa point of the design tasks 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)

### Required reading materials

- fib Bulletin 51 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 1. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883
- fib Bulletin 52 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 2. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883
- fib Bulletin 53 Structural Concrete : Textbook on behavior, design and performance*  
2nd - Volume 3. Federation International du Béton , 2009. ISBN: 1562-3610, 978-2-883
- fib Bulletin 54 Structural Concrete : Textbook on behavior, design and performance*  
2nd – Volume 4. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883
- fib Bulletin 54 Structural Concrete : Textbook on behavior, design and performance*  
2nd – Volume 4. Federation International du Béton , 2010. ISBN: 1562-3610, 978-2-883
- fib Bulletin 62 Structural Concrete : Textbook on behavior, design and performance*  
2nd – Volume 5. Federation International du Béton , 2012. ISBN: 1562-3610, 978-2-883
- Eurocode: Basis of structural design*  
EN 1990:2002/A1:2005 .
- Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*  
EN 1991-1-1:2002 .
- MSZ: Design of concrete structures Part 1-1.: General rules and rules for buildings*  
EN 1992-1-1: 2010 .
- MSZ: Design of concrete structures Part 1-2: General rules. Structural fire design*  
EN 1992-1-2: 2010 .
- MSZ: Concrete Part 1: Specification, performance production, conformity, and rules of application of MSZ*  
4798-1:2004. EN 206-1 in Hungary,
- Robert Park & Thomas Paulay: Reinforced Concrete Structures*  
Wiley-India Edition , 2010. ISBN: 978-81-265-2362-5

Subject: **COMPOSITE STRUCTURES**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: **2**



**1<sup>st</sup> week:**

**Lecture:** General presentation on composite structures in the world.

**2<sup>nd</sup> week:**

**Lecture:** Calculating the cross sectional data of steel I-beam with a reinforced concrete head-plate.

**3<sup>rd</sup> week:**

**Lecture:** Calculating elastic stress distribution in the cross section of steel I-beam with a reinforced concrete head-plate.

**4<sup>th</sup> week:**

**Lecture:** Calculating the elastic stress distribution in the cross section of steel I-beam with a reinforced concrete head-plate, taking creep in account.

**5<sup>th</sup> week:**

**Lecture:** Calculating the effective width of a head-plate.

**6<sup>th</sup> week:**

**Lecture:** TEST 1. Issuing a design task.  
**Self Control Test**

**7<sup>th</sup> week:**

**Lecture:** Calculating plastic bending resistance of steel I-beam with reinforced concrete head-plate.

**8<sup>th</sup> week:**

**Lecture:** Calculating plastic bending resistance of steel I-beam with a reinforced concrete head-plate. (further cases)

**9<sup>th</sup> week:**

**Lecture:** Calculating shear resistance of steel I-beam with a reinforced concrete head-plate.

**10<sup>th</sup> week:**

**Lecture:** Lateral torsional buckling of steel I-beam with a reinforced concrete head-plate.

**11<sup>th</sup> week:**

**Lecture:** TEST 2  
**Self Control Test**

**12<sup>th</sup> week:**

**Lecture:** Servicing limit states of steel I-beam with a reinforced concrete head-plate.

**13<sup>th</sup> week:**

**Lecture:** Composite columns

**14<sup>th</sup> week:**

**Lecture:** Composite plates with a trapezoidal steel plate.

**15<sup>th</sup> week:**

**Lecture:** TEST 3. Submitting a design task.

### Requirements

Topics: Materials of steel-concrete composite building structures. Elastic calculation of composite beams. Plastic calculation of composite beams. Design of composite columns. Design of slabs with a trapezoidal sheet.

A, for a signature: Participation 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. Attendance will be recorded. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator to each lecture. Active participation is evaluated by the teacher in every class. If a student's behavior 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 the design task as scheduled minimum at a sufficient level. During the semester there are three tests. Students have to reach the minimum level of points on each test. If the score of any test is below 10 from 20, the student once can take a retake test on all the topics.

B, for a grade: The course ends in a mid-term grade (AW5), based on the points of the task and the tests. Based on the points earned during the semester, 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)

### Required reading materials

*EUROCODE 4: Design of composite steel and concrete structures. Part 1-1: General rules and rules for buildings*

2010.

*JOHNSON R.P.: Composite structures of steel and concrete Voll*

Crosby Lockwood Staples, 1975.

*LAWSON R.M.: Design of composite slabs and beams with steel decking*

SCI Publications, 1989.

*LAWSON R.M., RACKHAM J.W.: Design of haunched composite beams in buildings*

Steel Construction Institute, 1989.

*HAENSEL J.: Effects of creep and shrinkage in composite construction*

University of Bochum , 1975.

*NEIL S., JOHNSON R., LAWSON R.M., MULLET D.L.: Design of composite trusses*

Steel Construction Institute, 1992.

Subject: **ENGINEERING TIMBER STRUCTURES**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** Timber as a structural material: strength and elastic properties.

**2<sup>nd</sup> week:**

**Lecture:** Design of members subjected to flexure.

**3<sup>rd</sup> week:**

**Lecture:** Design of members and walls subjected to axial or combined axial and flexural actions.

**4<sup>th</sup> week:**

**Lecture:** Design of glued laminated members.

**5<sup>th</sup> week:**

**Lecture:** Design of composite timber and wood-based sections.

**6<sup>th</sup> week:**

**Lecture:** Design of built-up columns.

**7<sup>th</sup> week:**

**Lecture:** Design of stability bracing, floor and wall diaphragms.

**8<sup>th</sup> week:**

**Lecture:** Design of metal dowel-typed connections.

**9<sup>th</sup> week:**

**Lecture:** Design of joints with connectors.

**10<sup>th</sup> week:**

**Lecture:** Moment capacity of connections formed with metal dowel fasteners or connectors.

**11<sup>th</sup> week:**

**Lecture:** Special timber structures: arches, frames, nailed shells and lattice structures.

**12<sup>th</sup> week:**

**Lecture:** Comparative analysis of existing timber structures.

**13<sup>th</sup> week:**

**Lecture:** consultation

**14<sup>th</sup> week:**

**Lecture:** consultation

**15<sup>th</sup> week:**

**Lecture:** consultation

### Requirements

Attendance at lectures is strongly recommended, but not compulsory. Participation at practicals is compulsory. Students must attend practicals 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 lectures and practicals will be recorded by the staff of the department. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practicals should be made up for at a later date, being discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures 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 and the five design 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 are three design tasks. In order to get the signature, minimum point of tests and design tasks has to be taken (min. 50 points of 80 points). In order to take an exam grade – minimum (2) pass grade – minimum point of the tests and the design tasks as well as exam points have 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 following: Two tests: Test I: Maximum: 30 points Minimum: 18 points Test II: Maximum: 30 points Minimum: 18 points Summa: 60 points 36 points Three design tasks: Design Task 1: Maximum: 15 points Minimum: 9 points Design Task 2: Maximum: 10 points Minimum: 7 points Design Task 3: Maximum: 15 points Minimum: 9 points Summa: 40 points 25 points Summa points: Maximum: 100 points Minimum: 61 points The course ends in a mid-semester grade (AW5). Based on the summa points of the tests and the summa points of the design tasks, 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)

### Required reading materials

*Eurocode: Basis of structural design*

EN 1990:2002/A1:2005 .

*Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

EN 1991-1-1:2002 .

*MSZ EN 1995-1-1: Design of timber structures Part 1-1: General. Common rules and rules for buildings*

2010.

*MSZ EN 1995-1-2: Design of timber structures. Part 1-2: General. Structural fire design*

2005.

*Eurocode EN 1990:2002/A1:2005 : Basis of structural design*

*Jack Porteous & Abdy Kermani: Structural Timber Design to Eurocode 5*

Blackwell Publishing , 2009. ISBN: 978-14051-4638-8

## CHAPTER 8

---

Subject: **STRENGTHENING OF STRUCTURES**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: **2**

**1<sup>st</sup> week:**

**Lecture:** Features of the building diagnostic tests.

**2<sup>nd</sup> week:**

**Lecture:** Expected lifetime of structures. Effects of reconstruction.

**3<sup>rd</sup> week:**

**Lecture:** Rules and methods of load tests.

**4<sup>th</sup> week:**

**Lecture:** Strengthening of reinforced concrete structures with post-tensioning.

**5<sup>th</sup> week:**

**Lecture:** Strengthening reinforced concrete structures with carbon fiber-reinforced belts.

**6<sup>th</sup> week:**

**Lecture:** Damages of masonry structures. Ways of strengthening.

**7<sup>th</sup> week:**

**Lecture:** Damages of arches and vaulted ceilings. Ways of strengthening.

**8<sup>th</sup> week:**

**Lecture:** Damages of buildings due to the

foundation. Methods of strengthening foundations.

**9<sup>th</sup> week:**

**Lecture:** TEST1

**Self Control Test**

**10<sup>th</sup> week:**

**Lecture:** Fixing local injuries of steel structures.

**11<sup>th</sup> week:**

**Lecture:** Strengthening of steel frame structures.

**12<sup>th</sup> week:**

**Lecture:** Strengthening of steel structures by modifying the bracing system.

**13<sup>th</sup> week:**

**Lecture:** Damages of wooden structures and ways of strengthening.

**14<sup>th</sup> week:**

**Lecture:** Damages of prefabricated structures. Ways of strengthening.

**15<sup>th</sup> week:**

**Lecture:** TEST2

**Self Control Test**

### Requirements

A, for a signature: Participation 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. Attendance will be recorded. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring a calculator to each lecture. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence due to the lack of active participation in class. During the semester there are two tests. Students have to reach the minimum level of points on each test. If the score of any test is below 30 of 50, the student once can take a retake test covering the whole semester material.

B, for a grade: The course ends in a mid-term grade (AW5), based on the points of the tests. Based on the points earned during the semester, 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)

## Required reading materials

*KORIS K. , BÓDI I.: Strengthening of structures*

URL:

[http://www.hsz.bme.hu/hsz/oktatas/feltoltesek/BMEEOHSASA4/strengthening\\_of\\_structures.pdf](http://www.hsz.bme.hu/hsz/oktatas/feltoltesek/BMEEOHSASA4/strengthening_of_structures.pdf)

*MAZZOLANI F.M.: Refurbishment by steelwork*

URL:

[http://www.arcelormittal.com/sections/fileadmin/redaction/pdf/Brochures/refurbishment\\_en.pdf](http://www.arcelormittal.com/sections/fileadmin/redaction/pdf/Brochures/refurbishment_en.pdf)

*MAZZOLANI F.M., IVÁNYI M.: Refurbishment of buildings and bridges*

Springer, 2002. ISBN: 978-3-211-83690-3

*CROSWELL R. M., WEBSTER M. D.: Guidelines for the Structural Provisions for the Repair, Alteration, Addition and Change of Use of Existing Buildings*

Boston Association Of Structural Engineers, 2002.

*MAZZOLANI F.M., Refurbishment by steelwork: Repair, restoration and strengthening of structures*

URL: [http://www.nicee.org/iaee/E\\_Chapter9.pdf](http://www.nicee.org/iaee/E_Chapter9.pdf)

*TALJSTEN B., CFRP.: strengthening - concrete structures strengthened with near surface mounted CFRP laminates*

URL: <http://quakewrap.com/frp%20papers/CFRP-Strengthening-Concrete-Structures-Strengthened-With-Near-Surface-Mounted-CFRP-Laminates.pdf>

Subject: **DESIGN OF BUILDINGS II**

Year, Semester: 4<sup>th</sup> year/1<sup>st</sup> semester

Lecture: 1

Practical: 2

**1<sup>st</sup> week:**

**Lecture:** Preparation, application for the courses, description of subject requirements, course schedule and literature lists, registration week

**2<sup>nd</sup> week:**

**Lecture:** History of Hungarian agricultural architecture, government regulations, the provisions of relevant OTÉK Opportunities for farm-site construction

**Practical:** Research - description of 3 processed agricultural structures - scheme, definition of static models and enveloping options.

**3<sup>rd</sup> week:**

**Lecture:** Presentation of livestock farms and prescriptions, animal health considerations and manure management.

**Practical:** Consultation.

**4<sup>th</sup> week:**

**Lecture:** Horse farming, stables, farming

buildings, sheep farming

**Practical:** Consultation.

**5<sup>th</sup> week:**

**Lecture:** Cattles, pig farming buildings

**Practical:** Consultation.

**6<sup>th</sup> week:**

**Lecture:** Storage buildings in agriculture

**Practical:** Consultation.

**7<sup>th</sup> week:**

**Lecture:** Wine processing, wineries, farm buildings

**Practical:** Deadline of the 1<sup>st</sup> project

**8<sup>th</sup> week:**

**Lecture:** Fire protection, basic concepts, classification of buildings, structure halls, fire distances, fire loads

**Practical:** Research - description of 3 processed agricultural structures - scheme, definition of static models and enveloping options

**9<sup>th</sup> week:**

**Lecture:** Industrial parks and it's benefits.  
Classification of Dressing rooms.  
**Practical:** Consultation

**10<sup>th</sup> week:**

**Lecture:** Preparation week for the semi-annual project, consultations only in announced time. A week for the semi-annual tests.  
**Practical:** Design of dressing rooms.

**11<sup>th</sup> week:**

**Lecture:** History of reinforced concrete, reinforced concrete long-span structures, the benefits of prefabrication  
**Practical:** Deadline for the 2<sup>nd</sup> project. A small Test.  
**Self Control Test**

**12<sup>th</sup> week:**

**Lecture:** Steel structures, hall structures.  
**Practical:** Opportunity to resit the test.

**13<sup>th</sup> week:**

**Lecture:** Industrial coatings, classical and light enveloping, wall and roof structures.  
**Practical:** Consultation.

**14<sup>th</sup> week:**

**Lecture:** Details of structures, industrial gates.

**15<sup>th</sup> week:**

**Lecture:** Preparation and correction week for the semi-annual project, consultations only in announced time. The end-term test this 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 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, being 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 behavior 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. Special conditions for signing and examination: Minimum: a half year performance means 38 points. Satisfactory: performance of the two mid-semester projects.

B, for a grade (AW5): Mid-semester : Exam (ESE): 2 x 25 50 points Study: 2 x 25 50 points 100 points The condition of the signature, and the exam-release is the performance on the exam, which have to be more than 50%, means min. 52 points. End of 2nd Semester Examination (ESE) Written 50 points A total of 150 points

### Required reading materials

*Malcolm Millais: Building structures*

*Philip Garrison: Basic Structures for Engineers and Architects*

*Jürgen Adam, Katharina Hausmann, Frank Jüttern: Industrial Buildings*

## CHAPTER 9 INTERNSHIP

### Civil Engineering BSc, Operational and Maintenance Specialization

Students majoring in the Civil Engineering BSc have to carry out a 4 weeks internship involved in the model curriculum. The internship course must be signed up for previously via the NEPTUN study registration system in the spring semester (4<sup>th</sup> semester). Its execution is the criteria requirement of getting the leaving certificate (absolutorium).

I. Objective of the internship, competences • 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.

II. Places suitable for internship All the organizations, institutions and companies, 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.

III. Documents necessary for commencing and completing the internship document copy signer(s) submission deadline receiver Invitation Letter 1 company 30<sup>th</sup> May 2017 secretariat (Mrs. Mónika Csákó Tóthné) Internship Cooperation (Company abroad) 2 copies or “Megállapodás” (Company in Hungary) 4 copies signer: company, faculty signer company, supervisor faculty, major responsible 30<sup>th</sup> May 2017 deadline: 30<sup>th</sup> May 2017 secretariat (Mrs. Mónika Csákó Tóthné) secretariat (Mrs. Mónika Csákó Tóthné) Student Agreement 3 copies, signers: company, faculty, student deadline. 30<sup>th</sup> May 2017 to: secretariat (Mrs. Mónika Csákó Tóthné) Evaluation Sheet and Certificate 1 copy signer: company deadline. 9<sup>th</sup> September 2017 to: secretariat (Mrs. Mónika Csákó Tóthné). Initiative of the internship at the company and providing for the documents from the company is the student’s duty. If the student doesn’t specify the receiving company or doesn’t provide for the Invitation Letter or the initiative of the Agreement and the Student Agreement (or its signature) in time, the major responsible will refuse the Internship Certificate.

IV. Execution of the Internship and its certification

1. The duration of the internship is 6 weeks.

2. Besides completing the internship, students have to compile a 15-20 pages essay about the work done. The topic of the essay must be negotiated with the supervisor and attached to the activity actually done by the student. It is expedient to choose a topic which may be appropriate either for participating in the National Scientific Students' Associations Conference ("OTDK") or a thesis.

3. The execution of the internship must be certified by the Evaluation Sheet and Certificate form can be downloaded from the website of the Department of Civil Engineering. The deadline of submitting the Essay and the “Evaluation Sheet and Certificate”: 9<sup>th</sup> September 2017, office 212. Summary of the tasks and deadlines regarding the internship

- the student sign up for the Internship course via the NEPTUN in the spring semester,
- contact the company and provide for the Invitation Letter (1 copy) must be submitted to the secretariat, for the Internship Cooperation (2 original copies, company is abroad) or “Internship Cooperation with Company in Hungary” (4 original copies, company is in Hungary ) and for the Student Agreement (3 original copies) respectively signed by the company till 30<sup>th</sup> May 2017. Please remember that it is the student’s responsibility to meet the deadline given! Having the documents signed by the Dean of the Faculty and sending copies to the company by post is the duty of the secretariat.

- executing the 6 weeks internship in the summertime,
- providing for the Evaluation Sheet and Certificate form at the end of the internship and submitting it together with the essay to Mrs. Mónika Csákó Tóthné responsible for the internship program at the department till 9<sup>th</sup> September 2017.

### V. Exemption

A partial exemption may be required by the student who has completed an internship in the secondary school and it is certified by the secondary school certificate. The request for partial exemption can be submitted till 30<sup>th</sup> May 2017. After this deadline requests are denied. The copy of the secondary school certificate and the written request addressed to Dr. Imre Kovács major responsible must be submitted to Dr. Imre Kovács (office 301). In case of any problem arising from the internship please contact Mr. Imre Kovács head of the Department of Civil Engineering (office 212, [dr.kovacs.imre@gmail.com](mailto:dr.kovacs.imre@gmail.com)) or Mrs. Mónika Csákó Tóthné secretary (office 212, [csmo@eng.unideb.hu](mailto:csmo@eng.unideb.hu)).

All the necessary formal documents can be downloaded from the website of the Faculty of Engineering. [www.eng.unideb.hu](http://www.eng.unideb.hu) (English Page/Internship)



## CHAPTER 10 THESIS

### 1. „Thesis” course

The „Thesis” course may be signed up for in the beginning of the semester via the NEPTUN system after negotiating it with the internal tutor (supervisor). During the semester students have to give an account of the actual state of the thesis to the internal tutor at least three times, which is certified on the Consultation Sheet. The Consultation Sheet is made out and managed by the supervisor. The thesis can be submitted at the end of the semester after approving it by the supervisor on the Consultation Sheet. The grade gained for it is not identical with the grade of the evaluation of the Thesis, it is merely a grade of the „Thesis” course. The precondition of approving the course must be negotiated with the supervisor however in general 80% readiness of the thesis is the minimum requirement. The Consultation Sheet signed by the supervisor must be bound into the thesis!

2. After negotiating with the supervisor for the company providing for the thesis topic, the external tutor has to have the Form of Thesis Topic Announcement signed certifying that his/her company provides Thesis Topic for the student. Thesis Topic Announcement Form signed by the external tutor and the company must be delivered to the Department. In addition to this, the filled form without signature in MS Word file should be sent to secretary's e-mail address as soon as it is finalized but not later than the deadline. On the basis of this, the Thesis Sheet is constructed by the Department and it must be bound into the thesis. The data necessary for constructing the Thesis Sheet must be handed in at the department (in that case as well, if the company didn't sign the Thesis Topic Announcement Form in time): - name of the student, - title of the thesis, - tasks must be elaborated in some sentences, (commonly the same as the chapters of the thesis), - name of the internal tutor (supervisor), - name of the external tutor, name of the company, - two chose subjects for the state exam (qv. state exam guide).

3. Plagiarism is strictly forbidden! Student has to sign the Plagiarism Statement must be bound into the thesis between the Thesis Sheet and the Consultation Sheet. The Plagiarism Statement must be filled electronic as well.

4. Formal Thesis Requirements (minimum number of pages, font style and size, prescriptions regarding the content, etc.) may be downloaded from the above mentioned website as well.

To be handed in:

- 2 bound copies (1 for the Department, 1 for the external examiner) The following must be bound (in this sequence):

- Thesis Sheet (with serial number and the signature of the head of department) – can be required from the secretariat after the end of November (it is not the sheet signed by the company!), - Plagiarism Statement – must be filled electronic and sign by the student, - Consultation Sheet (issued and signed by the supervisor), - occasional Confidential Agreement,

- photo 4x4 cm. To be handed in with the thesis, but not bound:

- max. 1 page abstract\* in English containing the name of the student, the title of the thesis, and the brief summary of the topic, with readable signature,

- max. 1 page abstract\* in Hungarian containing the name of the student, the title of the thesis, and the brief summary of the topic, with readable signature, - thesis in electronic version (tagged: name, major, title of thesis, date of state exam) on CD or DVD in MS Word or PDF format. \* It is not identical with the “Summary” chapter of the thesis though obviously similar to its content. It contains the objective, the topics and tasks elaborated by the student, and the conclusion in some sentences regarding the topic respectively! One copy of the thesis remains at the department which will be presented in the state exam. Another copy is given for the external examiner which after referee will get back to the student.

You can find all the formal documents you need to download on the website of the Faculty here:

<http://www.eng.unideb.hu> (English Page/Thesis)

### Objective

These guidelines describe the formal principles that must be observed when writing thesis at the Faculty of Engineering. Adhering to these principles ensures comparability between different theses. Furthermore, this guidance provides you assistance to the successful elaboration and submission of the thesis. General principles Students majored in engineering have to write thesis for completing the academic studies. The successful elaboration and submission of the thesis is the condition of admission for the finals. The aim of writing thesis is to systematize the theoretical and the professional knowledge of the candidates and to prove the skill in the field of constructing and seizing procedures. The thesis is a resolution of a real technical problem as an engineering task. The candidate proves by writing thesis that he/she is capable of working on engineering task independently. This is why the thesis must be elaborated and compiled with the greatest carefulness considering the specific requirements for format and structure.

The topics of the thesis are provided by the companies, firms, research institutes from their running tasks to be elaborated. Consequently, the appropriate solution of the engineering task is useful for the companies as well. Full and part time students can obtain thesis topic unaided from companies. The essay and experiment report made for the National Scientific Students' Association Conference ("OTDK") may be developed for degree thesis as well. For the elaboration of the thesis 3 weeks are ensured – stated in the model curriculum – after finishing the scheduled lessons in the term (before the examination period). Of course, there is opportunity to study the specialized literature and negotiate it with the supervisor earlier since the thesis topic has been issued previously. The candidate is supported by the internal tutor (supervisor) and the external tutor (supervisor) however the task must be solved individually. The internal supervisor assigned the details must be elaborated which could not be defined at the announcement of the thesis topic. The profoundness of the elaboration and the proportion of the parts are specified by the supervisors primarily and by the internal one. The thesis is pronounced by the supervisors to be appropriate for submission if it is completed and meets the formal, content and look requirements.

Format, layout, structure and the length of the thesis:

Structure of the thesis: (bounded with black fabric cover with gilt letters on it)

- Cover page- Original thesis sheet (must be bound!)
- Table of contents (with the page number 3, after that it is consecutively numbered)
- List of abbreviations and symbols (if applicable)
- Text (introduction, main part, conclusion)
- Bibliography
- Appendix (if applicable)
- Drawings
- Abstract (Max. 1 page abstract in Hungarian and in English containing the name of the student, the title of the thesis and the brief summary of the topic. The abstracts are not bound into the thesis!)

The structure of a paper should allow the reader to quickly gain an overview of its contents. It is thus important that the selected headings reflect the content in a concise way. The central theme should be clearly visible from the structure as presented in the table of contents.

Layout of the thesis:

The paper format is DIN A4, portrait orientation.

The thesis must be printed single-sided and bound in hardcover.

The page margin is 30 mm on left side to allow printing and binding.

The page margin is 20 mm on the right side.

The page margin is 25 mm on the top/bottom.

The recommended standard font and font size are the following:

- Times New Roman CE 13, full justification
- Arial CE 12, full justification

Line spacing is 1.5.

The content is structured in consecutively numbered chapters. Chapter sections and subsections should also be assigned a numerical index. E.g.: 1.Introduction 1.1. Problem definition 1.1.1. The method of inspection, measurement 1.1.1.1. Results, implication The chapter structure should not have more than 4 hierarchical levels. Headings of the first hierarchy 14 points, bold; heading 2: 12 points, bold; heading 3: 12 points, bold and italic; heading 4: 12 points, italic. One section requires a minimum of two sub-sections or none at all.

Page numbers should be indicated on every page on the bottom / outside. Length of the thesis: The main body of the text of the thesis must be between 30-50 A4 pages in length. It contains about 1500 characters (including space characters) per page. The table of contents, the reference list and appendixes are not to be included in the count. Additional tables, calculations and graphs that are too voluminous for or not explicitly mentioned in the running text have to be placed in the appendix. Language of the thesis: The thesis in the English program must be written in English. Both UK and US spelling are possible. Look of the thesis The look of the thesis has to be nice with uniform appearance in some respect. This is why the following formal specifications have to be kept. The pages are not framed like a sizing record or a shop drawing. Text and figures built in the text

The text has to be started with table of contents. The table of contents (on a separated page) is followed by the list of the abbreviations and symbols. You should start the main text with an introduction that briefly and clearly outlines the topic of your work and the survey of the specialized literature. The candidate has to prove his/her proficiency in the topic. The text should be concise clear and contain correct technical terms.

The figures and pictures have to be inserted into the Microsoft Word document. Tables and figures should be numbered and have a caption. Please be aware that also figures need to be referenced. In particular, please pay attention to copyright issues and the often-required permission to reprint figures.

The stressing and sizing procedures must be explained in the text in that way so that it can be followed by a non-professional person as well.

Before the main text begins, you should also include a list of abbreviations, a list of graphs and tables, and a list of formulas and symbols (in this order) that are used in your paper. They should also be listed in your table of contents. The list of abbreviations contains all the abbreviations that are used in the thesis except for those in common use like "e.g.", "etc.", "i.e.", which can be found in a standard dictionary. All abbreviated terms must be written out when they are first mentioned in the text.

Calculated and measured data should be compiled in a table placed either in the text or in the appendix with numbering and referring. Tables, graphs and formulas

Tables, graphs and formulas should be numbered continuously per section to make them uniquely identifiable. Example: Table 2.3 is the third table in chapter 2.

Tables and graphs are to be given a caption to characterize their content and should be explanatory by themselves. Example: Graph 3.4: Example of a table header (Source: Statistisches Bundesamt: Statistisches Jahrbuch 2008 für die Bundesrepublik Deutschland, Wiesbaden, September 2008, p. 58).

Additional tables and graphs that are too voluminous or are not explicitly mentioned in the running text must be placed in the appendix.

The formulas are numbered per section and the numbering must be stated on the right in parenthesis and right-justified.

Numbers

Numbers from zero to twelve should be written out.

To depict decimals use a point in English; thousands are separated by a comma in English (i.e. English: 1,234,567.89).

Units of measurement that do not follow a number are to be written out: “15 kg”, but “Kilogram is a unit of measurement.”

### References

References must be displayed in the list of references. Clear references are of importance throughout the thesis and must be numbered eg. [4]. The numbering of the references is made from 1 to “n” in the order of appearances. Referring to own papers or assignments must also be in a proper way. The same applies to references from the Internet. The electronic references must be referred to in such a way that a reader can relocate your reference. The plagiarism is strictly forbidden.

The reference list must contain:

Last name and initials of the author's first name

Full title of the book, periodical or article

Publisher and place of publishing

Year of publishing For Example: [4] Budynas.: Advanced Strength and Applied Stress Analysis Budapest, Mechanical Publisher, 2<sup>nd</sup> ed. 1998. p. 37-41.

### Drawings

Drawings are made either by computer program or by hand and ink in on max. A/1 drawing sheet. All the drawings must be numbered. The drawing number consists of two parts. The first part corresponds with the serial number of the thesis (placed at the right top corner of the cover page). The other one numbered from 1000 is the number of the drawing according to the rules of drawing numbering (assembly drawing, part assembly drawing, shop drawing). The drawings must be fold into A/4 size and put into the bag formed in the internal side of the cover at the back. It is expedient to inform the bookbinder about the amount of drawings must be stored in it. Handing in, evaluation The thesis fulfilling the formal requirements has to be handed in to the internal supervisor in two copies on schedule. The hand in-date is indicated on the thesis sheet. The submission is approved by the signature of the supervisor. The print out has to be accompanied by an electronic version on a CD or DVD (word, pdf or image format). The thesis is evaluated by the two supervisors. The final mark is given by the Finals Committee. One 4 cm x 4 cm photo of the candidate must be bound on the internal side of the cover at the back.

### Elaborating/submitting the Thesis

1. „Thesis” course The „Thesis” course may be signed up for in the beginning of the semester via the NEPTUN system after negotiating it with the internal tutor (supervisor). During the semester students have to give an account of the actual state of the thesis to the internal tutor at least three times, which is certified on the Consultation Sheet. The Consultation Sheet is made out and managed by the supervisor. The thesis can be submitted at the end of the semester after approving it by the supervisor on the Consultation Sheet. The grade gained for it is not identical with the grade of the evaluation of the Thesis, it is merely a grade of the „Thesis” course. The precondition of approving the course must be negotiated with the supervisor however in general 80% readiness of the thesis is the minimum requirement. The Consultation Sheet signed by the supervisor must be bound into the thesis!
2. After negotiating with the supervisor for the company providing for the thesis topic, the external tutor has to have the Form of Thesis Topic Announcement signed certifying that his/her company provides Thesis Topic for the student. Thesis Topic Announcement Form signed by the external tutor and the company must be delivered to the Department. In addition to this, the filled form without signature in MS Word file should be sent to [csmoni@eng.unideb.hu](mailto:csmoni@eng.unideb.hu) address as soon as it is finalized but not later than 14<sup>th</sup> November 2017. On the basis of this, the Thesis Sheet is constructed

by the Department and it must be bound into the thesis. The data necessary for constructing the Thesis Sheet must be handed in at the department (in that case as well, if the company didn't sign the Thesis Topic Announcement Form in time):

name of the student,

title of the thesis,

tasks must be elaborated in some sentences, (commonly the same as the chapters of the thesis),

name of the internal tutor (supervisor),

name of the external tutor, name of the company,

two chosen subjects for the state exam (qv. state exam guide).

3. Plagiarism Plagiarism is strictly forbidden! Student has to sign the Plagiarism Statement must be bound into the thesis between the Thesis Sheet and the Consultation Sheet. The Plagiarism Statement must be filled electronic as well. 4. Formal Thesis Requirements (minimum number of pages, font style and size, prescriptions regarding the content, etc.) may be downloaded from the above mentioned website as well.

To be handed in:

2 bound copies (1 for the Department, 1 for the external examiner) The following must be bound (in this sequence):

Thesis Sheet (with serial number and the signature of the head of department) - can be required from the secretariat after 30<sup>th</sup> November (it is not the sheet signed by the company!),

Plagiarism Statement - must be filled electronic and sign by the student,

Consultation Sheet (issued and signed by the supervisor),

occasional Confidential Agreement,

photo 4x4 cm.

To be handed in with the thesis, but not bound:

max. 1 page abstract\* in English containing the name of the student, the title of the thesis, and the brief summary of the topic, with readable signature,

max. 1 page abstract\* in Hungarian containing the name of the student, the title of the thesis, and the brief summary of the topic, with readable signature,

thesis in electronic version (tagged: name, major, title of thesis, date of state exam) on CD or DVD in MS Word or PDF format.

\* It is not identical with the "Summary" chapter of the thesis though obviously similar to its content. It contains the objective, the topics and tasks elaborated by the student, and the conclusion in some sentences regarding the topic respectively! One copy of the thesis remains at the department which will be presented in the state exam. Another copy is given for the external examiner which after referee will get back to the student.