Centre of Modern Languages

IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully.Civil Engineering courses are on the website seperately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W60A	Communication Skills - English - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	H10_acs	English	MON:10:15-12:00
Practice	K10_acs	English	TUE:10:15-12:00

.cs34CA72B{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;text-decoration: none;} .cs95B300B{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs1F994FB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:transparent;text-decoration: underline;font-style:normal;font-weight:normal;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs7AB323B{font-size:12pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=968 Recommended entrance level: B2- The course is aimed to prepare the students for communication in their professional field and work, but it also includes study-related topics. All the skills are developed including writing, but the main focus is on oral communication. - By the end of the course the students will be able to talk about their studies, professional interests, future plans, different types of work (for example small and large companies), their advantages and disadvantages, corporate culture, potential problems arising at work. The students will be able to resolve situations related to professional discussions, conflicts, corporate planning at work (planning discussions, presenting results). They become familiar with reasoning and negotiation techniques, and can successfully use them. They have the necessary skills to write short, formal letters, make suggestions, accept and refuse proposals politely.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W60N	Communication Skills - German - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	H12_nkk	German	MON:12:15-14:00

.cs34CA72B{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;text-decoration: none;} .cs95B300B{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs1F994FB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:transparent;text-decoration: underline;font-style:normal;font-weight:normal;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs7AB323B{font-size:12pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}

Detailed description: hhttps://edu.gtk.bme.hu/local/tad/tad.php?id=973Recommended entrance level: B2- The course is aimed to prepare

the students for communication in their professional field and work, but it also includes study-related topics. All the skills are developed including writing, but the main focus is on oral communication. - By the end of the course the students will be able to talk about their studies, professional interests, future plans, different types of work (for example small and large companies), their advantages and disadvantages, corporate culture, potential problems arising at work. The students will be able to resolve situations related to professional discussions, conflicts, corporate planning at work (planning discussions, presenting results). They become familiar with reasoning and negotiation techniques, and can successfully use them. They have the necessary skills to write short, formal letters, make suggestions, accept and refuse proposals politely.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W62A	Cross-cultural Communication - English - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Cs14_axc	English	THU:14:15-16:00
Practice	K10_axc	English	TUE:10:15-12:00

.csC176A7B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;}
.cs7CFEB6B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;text-decoration: none;}
.cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}
.cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt}
.cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;}
.cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;}
.cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt}
.cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt}
.csC162C0B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;}
.csD80DFDB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:#FFFFFF;text-decoration: underline;font-style:normal;font-weight:bold;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=977 Recommended entrance level: B2- The course is aimed to develop communication skills through the topic of cultural differences and prepare participants for managing intercultural situations they might face in their academic and/or professional career in a globalised world. The focus is on oral skills development, though reading and listening comprehension, as well as writing skills are included.- Upon completing the course participants will be able to talk about the background of cultural differences, manage intercultural differences with raised awareness and open up to groups from other cultures. Students can identify and analyse the values underlying cultural differences, as well as manage multicultural workplace or scientific and business situations which involve conflict management, discussing, planning and implementing ideas. The course not only develops analytical skills required to gauge and solve intercultural situations, but also emotional intelligence. - Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W62N	Cross-cultural Communication - German - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Cs10_nxc	German	THU:10:15-12:00

.csC176A7B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;}
.cs7CFEB6B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;text-decoration: none;}
.cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}
.cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt}
.cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;}
.cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;}
.cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt}
.cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt}
.csC162C0B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;}
.csD80DFDB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:#FFFFFF;text-decoration: underline;font-style:normal;font-weight:bold;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=979 Recommended entrance level: B2- The course is aimed to develop communication skills through the topic of cultural differences and prepare participants for managing intercultural situations they might face in their academic and/or professional career in a globalised world. The focus is on oral skills development, though reading and listening comprehension, as well as writing skills are included.- Upon

completing the course participants will be able to talk about the background of cultural differences, manage intercultural differences with raised awareness and open up to groups from other cultures. Students can identify and analyse the values underlying cultural differences, as well as manage multicultural workplace or scientific and business situations which involve conflict management, discussing, planning and implementing ideas. The course not only develops analytical skills required to gauge and solve intercultural situations, but also emotional intelligence. - Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W62O	Cross-cultural Communication - Italian - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Sz14_olxc	Italian	WED:14:15-16:00

@page {margin: 94px 94px 94px 94px;}.docbody {font-family: 'Times New Roman'}p.MsoNormal, li.MsoNormal, ul.MsoNormal, div.MsoNormal{ margin-top:0px; margin-right:0px; margin-bottom: 1.0pt; margin-left:0cm;line-height:1.07; font-size:11.0pt; white-space: pre-wrap} Recommended entrance level: B2- The course is aimed to develop communication skills through the topic of cultural differences and prepare participants for managing intercultural situations they might face in their academic and/or professional career in a globalised world. The focus is on oral skills development, though reading and listening comprehension, as well as writing skills are included.- Upon completing the course participants will be able to talk about the background of cultural differences, manage intercultural differences with raised awareness and open up to groups from other cultures. Students can identify and analyse the values underlying cultural differences, as well as manage multicultural workplace or scientific and business situations which involve conflict management, discussing, planning and implementing ideas. The course not only develops analytical skills required to gauge and solve intercultural situations, but also emotional intelligence.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W62S	Cross-cultural Communication - Spanish - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Sz14_sxc	Spanish	WED:14:15-16:00

.cs34CA72B{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;text-decoration: none;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs1F994FB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:transparent;text-decoration: underline;font-style:normal;font-weight:normal;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs5CC07D4 {margin:12pt 0pt 12pt 0pt;text-align:left;text-indent:0pt} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .csC162C0B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .cs7AB323B{font-size:12pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=981 Recommended entrance level: B2- The course is aimed to develop communication skills through the topic of cultural differences and prepare participants for managing intercultural situations they might face in their academic and/or professional career in a globalised world. The focus is on oral skills development, though reading and listening comprehension, as well as writing skills are included.- Upon completing the course participants will be able to talk about the background of cultural differences, manage intercultural differences with raised awareness and open up to groups from other cultures. Students can identify and analyse the values underlying cultural differences, as well as manage multicultural workplace or scientific and business situations which involve conflict management, discussing, planning and implementing ideas. The course not only develops analytical skills required to gauge and solve intercultural situations, but also emotional intelligence.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W63A	Hungarian Culture	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	K8_aHC	English	TUE:08:15-10:00

.cs34CA72B{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;text-decoration: none;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt

0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs1F994FB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:transparent;text-decoration: underline;font-style:normal;font-weight:normal;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs5CC07D4 {margin:12pt 0pt 12pt 0pt;text-align:left;text-indent:0pt} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs7AB323B{font-size:12pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=1259 Recommended entrance level:: B2 - The series of lectures is designed to engage students in learning about Hungarian people, the land, history, cultural traditions and geography. The lecture focuses on Hungary's history and culture in considerable depth from the arrival of the Magyars to the Carpathian basin in 896 to the present day, which creates a better understanding of today's Hungarian conditions.- After completing the course, participants will be able to identify important historic events and their impact on today's social, political and economic situation. Also, students will become familiar with the main geographical areas and their architectural heritage from Roman ruins and medieval townhouses to Baroque churches, Neoclassical public buildings and Art Nouveau bathhouses and schools. Getting acquainted with Hungary's rich folk traditions, such as the wonderful embroidery, porcelain, wooden artefacts and music, students will have a better understanding of the Hungarian soul and symbols.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W64A	English for Engineers - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Sz8_amű	English	WED:08:15-10:00
Practice	K8_amű	English	TUE:08:15-10:00

.cs34CA72B{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;text-decoration: none;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs1F994FB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:transparent;text-decoration: underline;font-style:normal;font-weight:normal;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs7AB323B{font-size:12pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=984 Recommended entrance level: B2- The course is aimed to develop competencies required for effective general and technical/specialist communication in English. There is an equal emphasis on both written and spoken English. In the course students are introduced to distinctive uses of technical texts, with particular emphasis on their lexical and syntactic characteristics. Students acquire the basic technical terminology in all fields of engineering.- By the end of the course students are able to understand more complex technical texts. Moreover, they are able to create simple technical scripts bearing the basics of the technical register in mind. They are able to formulate their opinions concerning specialist topics. They recognise and use terminology related to their own fields of interest and outside their profession's scope. They are able to elaborate on: technical inventions, innovations, appliances, devices, mechanisms, materials technology, properties of materials, basic geometrical shapes, primary mathematical concepts, proper names of tools, the principles of energy technology and the basic questions of sustainability.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W64N	German for Engineers - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Cs14_nmű	German	THU:14:15-16:00

.cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .csF86573B{font-size:12pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;text-decoration: none;} .csF59EFB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:transparent;text-decoration: underline;font-style:normal;font-weight:bold;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;}

.cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs7AB323B{font-size:12pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=985Recommended entrance level: B2- The course is aimed to develop competencies required for effective general and technical/specialist communication in English. There is an equal emphasis on both written and spoken English. In the course students are introduced to distinctive uses of technical texts, with particular emphasis on their lexical and syntactic characteristics. Students acquire the basic technical terminology in all fields of engineering.- By the end of the course students are able to understand more complex technical texts. Moreover, they are able to create simple technical scripts bearing the basics of the technical register in mind. They are able to formulate their opinions concerning specialist topics. They recognise and use terminology related to their own fields of interest and outside their profession's scope. They are able to elaborate on: technical inventions, innovations, appliances, devices, mechanisms, materials technology, properties of materials, basic geometrical shapes, primary mathematical concepts, proper names of tools, the principles of energy technology and the basic questions of sustainability.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W65A	Business English - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	K10_abl	English	TUE:10:15-12:00

.csC176A7B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs13FD22B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;text-decoration: none;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .csC162C0B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .csCBAB87B{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:#FFFFFF;text-decoration: underline;font-style:normal;font-weight:normal;}

Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=986 Recommended entrance level: B2- The course is aimed to engage students in business communication in the target language, to master business English vocabulary and to understand business processes. The course is aimed at students pursuing economics and engineering studies, providing them with the opportunities to understand and accept the similarities and differences in economic and engineering approaches.- After completing the course, students will understand not only professional texts but also texts and videos intended for a wider audience, and they will be able to write texts related to managerial work (e.g., summary, reminder, official letter). As a result of the structured development of economic vocabulary, students are able to participate in workplace communication, can comment on economic events, and gather, organise, and share information about companies.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W65N	Business German - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	H14_nbl	German	MON:14:15-16:00

.csC176A7B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs13FD22B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;text-decoration: none;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .csC162C0B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-

style:normal;font-family:Calibri;} .csCBAB87B{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:#FFFFFF;text-decoration: underline;font-style:normal;font-weight:normal;} Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=988Recommended entrance level: B2- The course is aimed to engage students in business communication in the target language, to master business English vocabulary and to understand business processes. The course is aimed at students pursuing economics and engineering studies, providing them with the opportunities to understand and accept the similarities and differences in economic and engineering approaches.- After completing the course, students will understand not only professional texts but also texts and videos intended for a wider audience, and they will be able to write texts related to managerial work (e.g., summary, reminder, official letter). As a result of the structured development of economic vocabulary, students are able to participate in workplace communication, can comment on economic events, and gather, organise, and share information about companies.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W67N	German in Company Contexts - B2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Sz12_nDAF	German	WED:12:15-14:00

.csC176A7B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs13FD22B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;text-decoration: none;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .csC162C0B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .csCBAB87B{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:#FFFFFF;text-decoration: underline;font-style:normal;font-weight:normal;} .csFB35A1B{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times Roman;}
Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=991Recommended entrance level: B2- The course is aimed to improve B2-level communication required for employment. It focuses on improving verbal and written communication, with all language skills being developed in a balanced way to teach students about using the language in a professional setting.- After completing the course, students will be able to talk about the various types of work and their own professional development, as well as understand the key information of texts they inevitably come across at work (e.g. job advertisement, employment contract, etc.). In addition, they will be able to produce texts for a job application by using the typical syntactic and lexical elements.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Subject code	Subject name	Requirement	ECTS credit
BMEGT60W68A	English for University Studies - B2+	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	Sz10_aUN	English	WED:10:15-12:00

.csC176A7B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .cs7CFEB6B{font-size:12pt;font-weight:bold;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;text-decoration: none;} .cs95B2DFB{font-size:12pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Calibri;} .cs1D21654{text-align:left;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .cs98C2414{margin:12pt 0pt 12pt 0pt;text-align:justify;text-indent:0pt} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs3270F94{margin:0pt 0pt 0pt 0pt;text-align:left;text-indent:0pt} .cs27B0404{text-align:justify;margin:0pt 0pt 1pt 0pt;line-height:1.07;text-indent:0pt} .csC162C0B{font-size:12pt;font-weight:normal;color:#000000;background-color:#FFFFFF;font-style:normal;font-family:Calibri;} .csD80DFDB{font-size:12pt;font-family:Calibri;color:#0000FF;background-color:#FFFFFF;text-decoration: underline;font-style:normal;font-weight:bold;} Detailed description: https://edu.gtk.bme.hu/local/tad/tad.php?id=992 Recommended entrance level: B2+ The course aims at developing

the language skills of students who intend to proceed with their studies in English at a Hungarian or a foreign university. The main objective is to focus on language skills required for studies English in a higher education environment.- By the end of the course students will be able to follow academic lectures, and they will also be able to take notes and write summaries about these lectures. They will be aware of the main reading strategies necessary for understanding academic literature, and they will be able to take notes and prepare summaries of written texts. They will be familiar with the main characteristic features of producing written texts for specific purposes. They will be able to write CVs, motivational letters and formal letters related to their studies and administrative tasks. They will be aware of the specific features of polite professional communication (e.g. correspondence with instructors), and they will also be able to provide feedback and make recommendations related to professional discussions.- Completion requirement: active participation in classes (maximum 30% absence allowed) and completion of assignments and / or progress tests issued during the semester.

Faculty of Architecture

IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully.Civil Engineering courses are on the website seperately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

Subject code	Subject name	Requirement	ECTS credit
BMEEPAG0236	Applied Building Information Modelling B (Archicad advanced)	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	EN1-ER	English	

This course aims to expand the existing CAD knowledge of students to be able to create and modify complex CAD models easily. During the course, we use Archicad, so a basic knowledge of the program is expected.

Subject code	Subject name	Requirement	ECTS credit
BMEEPAG0246	Applied Building Information Modelling A (Revit Architecture)	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	EN1-ER	English	

Design and documentation with Revit Architecure - Introductory course.Design and basic CAD knowledge is recommended. (Architectural informatics 2)

Subject code	Subject name	Requirement	ECTS credit
BMEEPAG0247	Constructive CAAD G	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	EN1-ER	English	

Introduction to Google Sketchup, an easy to use 3D design software to create 3D visual models of buildings together with its surroundings. Basic modelling, textures, creating models from plans and matching photo. (See http://www.epab.bme.hu/?sketchup/index.en.html). Architects from all around the world use Google SketchUp in nearly all phases of design, starting from solid modelling to photorealistic 3D rendering. Sketchup is a simple, but powerful tool to visualize ideas in 3D. Easy to learn, simple, fullz understandable, helps the user to evolve creativity. Needs less time to find the right tool enables to spend more time with what we learn for... to be an architect!

Subject code	Subject name	Requirement	ECTS credit
BMEEPAG0249	Constructive CAAD CE	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	EN1-ER	English	

Advanced CAD modelling course for students who are familiar with AutoCAD. The course deals with modeling concepts and techniques, texture, lighting and rendering. In the second part of the semester students work more or less autonomously (with occasional one-on-one consultations) on a model of their choice. See: http://www.epab.bme.hu/en/?ccce/

Subject code	Subject name	Requirement	ECTS credit
BMEEPAGA205	Digital Representation	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	EN1-ER	English	TUE:10:15-12:00
Laboratory	EN1-ERl	English	TUE:10:15-12:00
Lecture	EN0-ER	English	TUE:10:15-12:00

Subject code	Subject name	Requirement	ECTS credit
BMEEPEG0995	Architectural Research for Exchange Students - EG	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Architectural Research for Exchange Students on the topics of the Department's competency. The aim of the subject is to carry out a research on a special topic. The research contains specifying and processing the related international literature, summing up the findings in a study and finally a presentation. The language of the research depends on the consultant - the available topics are listed on the department's homepage.

Subject code	Subject name	Requirement	ECTS credit
BMEEPEGA601	Building Service Engineering 2	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	MON:14:15-16:00

Calculation of heat loss of buildings. Energy consumption of a heated space. Introduction to fluid flow. Classification of Heating. Central heating. Elements of water heating system. Pipe distributing networks Emitters and surface heating. Controlling. Renewable energy sources for heating and producing domestic dot water. Introduction to psychometrics. Psychometric processes. Ventilation (Classification, natural ventilation and mechanical one, fundamental systems of air inlet and extract) Estimation of the necessary air volume. Air heating and cooling systems. Air conditioning.

Subject code	Subject name	Requirement	ECTS credit
BMEEPEGMM01	Building Energetics MM	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:14:15-16:00
Practice	EN1	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEPEK0626	Real-Estate Development	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	EN1-ER	English	

Basics of RE development: The RE Cycle. Contributors and actors in the process. Real estate Market. Descriptive figures of market segments. RE Market, presentation of different markets. Market Valuation, Definition of the Market Value. Other valuation bases: RICS, TEGOVA. Valuation methodology. Development Process : the process and the Developer. Main international development companies. Feasibility Study, legal, technical and economic analysis. Sensitivity analysis. Development Parameters: GBA, GLA, lot coverage ratio, green area. Functional mix. Potential rental and other revenues. Development Cost, elements of the building costs, structure of the operation costs, yearly CF calculation. RE Marketing: Sales methodology, traditional and new marketing tools. RE Agencies and their activities. Contracting, contract types, contracting process. RE Financing.

Subject code	Subject name	Requirement	ECTS credit
BMEEPEK0995	Architectural Research for Exchange Students - EK	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Architectural Research for Exchange Students on the topics of construction technology and management. The aim of the subject is to carry out a research on a special topic. The research contains specifying and processing the related international literature, summing up the findings in a study and finally a presentation. The language of the research depends on the consultant - the available topics are listed on the department's homepage.

Subject code	Subject name	Requirement	ECTS credit
BMEEPEKA701	CM3 - Planning of Construction Technology	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	WED:10:15-12:00
Practice	EN1-ER	English	WED:12:15-14:00

The goal of the subject is to present information on the planning of elementary construction technologies related to superstructures and finishing work.The subject introduces how to apply recent innovations of building technologies during design and realisation. It gives a basic knowledge to evaluate construction options and make appropriate decisions about technology. There are case studies of building technologies used in construction of loadbearing structures, finishing and cladding works.The practical part contains workshops on planning of construction technologies: connection of structures and technologies, volume calculation, resource estimation, scheduling and construction site planning.

Subject code	Subject name	Requirement	ECTS credit
BMEEPEKA801	Building and Architectural Economics	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	WED:08:15-10:00

Aim: investigate the economic side of a real estate development emphasizing the Social cost and benefit of development.This module concentrates economical computation models, theories dealing with real estate valuation. There is a homework concerning with calculation, valuation of a real estate development. Successful submission is required for the module acceptance. Written mid-semester test as indicated, minimum pass grade required.

Following main topics are discussed: construction cost, estimates, time value of money, building life cycle cost , measuring the worth of real estate investments.

Subject code	Subject name	Requirement	ECTS credit
BMEEPEKAT41	Construction Management	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:12:15-14:00(K174); WED:12:15-14:00(K174)
Practice	EN1	English	THU:14:15-16:00(K234)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEPESA201	Building Constructions 1.	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	MON:08:15-10:00
Practice	EN1-ER	English	TUE:08:15-10:00

This subject presents the details of the main load-bearing constructions (walls, floors, stairs) and the joints between them. Wall supported / skeleton frame, or mixed construction. Walls: Effects on walls, and how to fulfil the requirements. Sorting the walls by function, position, material, by layer-order. Walls built from elements, the development of walling elements. Floors: Functions, effects on floors, how to fulfil the requirements. Elements of floor construction. Types: plain floors (in details), arches (overview). The materials, construction lines, building methods, About the future of floors Joints between walls – floors, skeleton frames – floors. Methodology of the floor design. Stairs: Functions, effects on staires, how to fulfil the requirements, principles of stressing and how to choose construction. Sorting the constructions by material, load bearing method, building method … etc. Design possibilities.

Subject code	Subject name	Requirement	ECTS credit
BMEEPESA401	Building Constructions 3	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	TUE:08:15-10:00
Practice	EN1-ER	English	FRI:08:15-10:00

General and detailed review of the structures of the elevation constructions. The most important aim of the subject is the analysis of the external separating constructions. Principles of the continuity of the protecting levels depending on the position in the structure. Multi-layer external separating walls, construction methods of the elevation claddings and elevation coverings, the ordinary and special external doors and windows. Complementary structures for the external doors and windows, especially the shading devices. Requirements for the external separating structures and performances of the different constructions. Building physics: heat and vapour physics, acoustic features of the external separating structures.

Subject code	Subject name	Requirement	ECTS credit
BMEEPESQ602	Building System Methodology (Building Constructions 5.)	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	TUE:12:15-14:00
Practice	EN1-ER	English	MON:10:15-12:00

Subject code	Subject name	Requirement	ECTS credit
BMEEPET0408	History of Theory of Architecture 2	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	EN1-ER	English	THU:13:15-15:00

HISTORY OF THEORY OF ARCHITECTURE 2. BMEEPET0408 The course presents, exposes and explains the most important constituent facts, selected from the innumerable different intellectual reflections of the twentieth century and the second millennium, as a rich and simultaneous interplay of parallel stories, either promoting, or opposing each other. It doesnrsquo;t interpret history as a homogeneously evolving story, emerging from the past, but at the same time, it doesnrsquo;t deny the importance and operative function of creating histories. Instead of a simple, successive presentation of well-known historical facts, or a collection of fashionable notions, topics and themes, it rather concentrates on exploring their synchronic functional relationships and finding creative and relevant

conclusions. 1. Introduction, theory and history in the 20th century. 2. Dominant modern reflections: Riegl, Loos Corbusier 3. Science, technology, art, future, constituent parts of the modern identity Submission and discussion of first paper. 4. Great histories of modern architecture. History, or theory? 5. The destructions of modern technologies. Totalitarian regimes, and the war. Post war time, neo-technicism and total utopias of the sixties, Banham, Archigram. 6. Rediscovery of the operative function of history. Kahn, Venturi. Vulgar modernism and vulgar historicism. Submission and discussion of second paper. 7. The global, the regional, the rural, the archaic. Structuralism, accidentism. 8. Positive and negative side of modern urbanism. 9. Beyond modern histories. Critical theories anthologies. Presence and representation. Deconstruction, phenomenology, hermeneutics. Submission and discussion of third paper.

Subject code	Subject name	Requirement	ECTS credit
BMEEPET0801	Hungarian Historic Buildings in Context	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEPET0995	Architectural Research for Exchange Students - ET	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Similarly to the international practice, the course aims research activity in architecture and its documentation primarily. The research topics' possible horizon is determined by the course lists of the departments and the students' interest. Besides the architectural topics, the course will appreciate interdisciplinary and special fields in the international environment. The project work will demonstrate generic and specific skills and understanding of the research's open and synthetic character. The objective of this course is to hone the skills of analysis and abstraction in order to develop a framework for research. The student should be able to draw from precedent in the art, architecture, and engineering in the development of this framework, which will act as scaffolding for the theoretical, experimental, and creative decisions. This course will consist of a series of consultations with the teachers, but the essay should write by the student. The available topics are given by the Departments of the Faculty. The student can also propose a special topic for research during the course, but the teacher must be agreeing with the proposal. The available topics are listed on the department's homepage: http://www.eptort.bme.hu/

Subject code	Subject name	Requirement	ECTS credit
BMEEPETA201	History of Architecture 2. (Antiquity)	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	WED:14:15-16:00
Practice	EN1-ER	English	WED:16:15-17:00

The intended task of the subject is to investigate the evaluation and formation of the European architecture of the four main cultures as Mesopotamia, Egypt, Greece and Rome. Before introducing to the evaluation of architecture we are speaking the used building materials and the structures involved. The presentation of architecture follows chronological order, analysing the functional expectation of the building types used. In Mesopotamia we discuss the space demands of the sacral, the dwelling and the palace architecture. The analysis makes possible to prove the early use of space systems in architecture. The accented topic in Egypt is the evaluation of monumental architecture in stone. It is important to understand, that the later funerary buildings are not unique architectural constructions, but part of a composition. The Hellenic and the Roman civilisation is basically an urbanistic culture. That is the reason, that both cultures are discussed through their developments in settlements. The analysis of Hellenic temple construction gives opportunity to discuss the evaluation of the Greek and Roman orders.

Subject code	Subject name	Requirement	ECTS credit
BMEEPETA401	History of Architecture 4	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	MON:12:15-14:00
Practice	EN1-ER	English	MON:14:15-15:00

Brunelleschi and the early renaissance architecture in Tuscany. The evolution of the renaissance palace in Florence and in the Northern regions of Italy. The architect and scholar Leon Battista Alberti. Bramante and and the influence of his circle in the first half of the 16th century. Michelangelo Buonarroti architect. Renaissance in Lombardy and Venice. Mannerist architecture. The late sixteenth century: Palladio and Vignola. Urban development and early baroque architecture in Rome under Pope Sixtus V. The architecture of Lorenzo Bernini and Francesco Borromini. Baroque in Venice and in Piemont. Architecture in France in the 16-17th centuries. Baroque in central Europe: Austria, Bohemia and Germany.

Subject code	Subject name	Requirement	ECTS credit
BMEEPETO601	History of Architecture 6	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	THU:17:15-20:00

The course gives an overview of the architecture in the 20-21st centuries. The classes follow chronology with focusing on the works of some great architects: Modernism and Modern Movement. Architecture between the two world wars – De Stijl, Bauhaus, Russian Constructivism, Less is more – Architecture of Ludwig Mies van der Rohe, Toward a New Architecture – Architecture of Le Corbusier. The Nordic Classicist Tradition – Architecture of E. G. Asplund and S. Lewerentz. Alvar Aalto and the modern Finnish architecture. In the second part the course picks up some relevant architectural trends: New Empiricism, New Humanism, New Brutalism and the Team X, the way from large housing estates to architecture without architects. Unfolding post-modern architecture, participation and the Las Vegas strip, Colin Rowe's studio, Critical Regionalism. The third part concentrates on timely problems: new materials or the multi-sensorial experience of space and surface, Rem Koolhaas's Dirty Realism, new technology and digital perception, architecture of seduction.

Subject code	Subject name	Requirement	ECTS credit
BMEEPETO801	History of Architecture in Hungary 1	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	TUE:10:15-12:00

The subject History of Architecture in Hungary I. aims to present and analyze the architecture of historic Hungary in European and domestic context from the history of Pannonia to the end of Baroque. The principle of the presentation is the chronological interdependence, however, particular attention is given to the main trends within the different periods as the main stylistic tendencies or external and internal factors that determine the historical and architectural context. A great emphasis is given to the exploration of the connections between the European and Hungarian history of architecture. Lecture topics include: The beginnings of architecture in the Carpathian Basin. Roman architecture in Hungary. Early medieval architecture in Hungary - Christian Architecture between West and East. The flourishing Romanesque and the beginnings of Gothic Architecture. The rise of Gothic Architecture - architecture in towns and Gothic architecture of the orders. The beginning and the first period of the renaissance till the middle of th 16th century. The architecture of fortified palaces and fortifications. The renaissance architecture in Transylvania. The beginnings of the baroque in Western Hungary in the 17th century. The High Baroque in Hungary.

Subject code	Subject name	Requirement	ECTS credit
BMEEPETQ802	History of Architecture in Hungary 1	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEPIPA401	Architecture of Workplaces 1	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	EN0-ER	English	THU:13:15-15:00

The history of industrial architecture, the history of Hungarian industrial architecture. Load-bearing structures of halls and of multi-storey buildings. Size standardization. Constructions of space separation, facades, subsytems of space separation constructions (foundations, roof structures, intermediate floors, external wall systems, finishes. Characteristic architectural requirements, social facilities. Logistics: transport, storage. From location to layout, emplacement of industrial plants. Design methodology, re-use, reconstruction. Offices.

Subject code	Subject name	Requirement	ECTS credit
BMEEPIPQ703	PRAXIS – Architectural strategies	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	FRI:14:15-16:00

Subject code	Subject name	Requirement	ECTS credit
BMEEPKO0995	Architectural Research for Exchange Students - KO	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Similar to the international practice aims the course primary research activity on architecture and its documentation. The possible horizon of the research topics is determined by the course lists of the departments and the personal interest of the students. Beside the architectural topics will give the course an appreciation of interdisciplinary and special fields in international environment too. The project work demonstrating generic and specific skills and understanding of the open and synthetic character of the research. The objective of this course is to hone the skills

of analysis and abstraction in order to develop a framework for research. The student should be able to draw from precedent in both art, architecture and engineering in the development of this framework, which will act as scaffolding for the theoretical, experimental and creative decisions. This course will consist of a series of consultations to the teachers, but the essay should written by the student. The available topics are given by the Departments of the Faculty. The student can propose also a special topic for research during the course, but the teacher has to be agree with the proposal.

Subject code	Subject name	Requirement	ECTS credit
BMEEPKOA402	Design Methodology	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:08:15-10:00

Design Methodology course introduces theoretical and practical principles of architectural design flow. The point of theoretical part is to show the history and philosophical aspects of design process, while practice is mainly trained in parallel courses. Through lectures and home works students develop skills of creativity, representation and modeling the real design activities. The process of architectural design thus can be compared to an informatics system, so for making the method more clear. Practical Design Methodology is closely connected to the Public Building Design 2 course, extending it with special design aspects and details. Through analyzing existing buildings and fictional situations interesting practical problems and solutions can be introduced and discussed. Several special methods of new facilities, building reconstructions and technologically or structurally determined buildings are also presented, to gear towards understanding the need for collaboration with design partners. Because of its importance, local and global responsibility, sustainability, free access and ecological design will be touched along whole study, to understand the meaning of “fair architecture”.

Subject code	Subject name	Requirement	ECTS credit
BMEEPRA0995	Architectural Research for Exchange Students - RA	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

University of UniversitiesStudents joining the Department of Graphics, Form amp; Design will have the opportunity to participate at the University of Universities. UoU (https://uou.ua.es) is an international / interacademic course with the contribution and close collaboration of 40 faculties of architecture and arts around Europe, of which our department has been an active member since its first edition three years ago. Instead of a single specific research program, our students will have the opportunity to join six (2-week long) compact project or research-based creative amp; scientific workshops, over the course of the semester. Each of the 6 sessions offer a selection of 3 to 5 online workshops, covering various fields of Architecture amp; Arts, among which students have complete freedom to choose, according to their interest and preference. We will also offer students developing the results of one or more of their workshops into a scientific paper the opportunity to publish at the open access UoU Scientific Journal (indexed at DOAJ / SHERPA / RoMEO / Dialnet / Norwegian Register for Scientific Journals).For more information, please visit the following link: http://www.rajzi.bme.hu/en/research/research-themes/630-university-of-universities

Subject code	Subject name	Requirement	ECTS credit
BMEEPRAA405	Form and Composition 2.	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Practice	EN1	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEPRAA601	Drawing and Composition 6	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

The main topic in the syllabus in this semester is the intuitive representation of internal and external spaces: this subject aims at teaching students perspective representation at a higher level (applying 3-6 vanishing points). While drawing the streets and squares of the Buda Castle and the internal spaces of some atmospheric old public building sin Budapest (e.g. Saint Stephen Cathedral, Opera House, Hungarian National Museum) students investigate invisible geometrical and structural relations and improve their drawing skills (applying lead pencil, ink and crayon techniques). The objective is not to simply represent a naturalistic view as a camera, but to prepare a drawing of the architectural structure of a real space after grasping the gist of the compostion.

Subject code	Subject name	Requirement	ECTS credit
BMEEPRAO702	Drawing 7.	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

The course examines the relationship between colour and colour, colours and humans, and between colours and the built environment. Technical introduction of pigments, behaviour of colours when mixing pigments, the basic

techniques of painting. The role of colours in the creative character and in the thoughtfully built environment. Presentation of the exterior architectural colour design, colour preferences and theories in the different historical periods. The concept and conditions of colour harmonies, guide to the effective use of the different harmony-theories. The use of colour design in everyday projects (authentic colouration in historic renovation, aesthetic urban rehabilitation, etc.) Students learn the architectural use of colour design through a series of projects, from the manual techniques of painting to digital colouration.

Subject code	Subject name	Requirement	ECTS credit
BMEEPRAQ801	Visual Communication	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEPRAQ90U	Drawing and Composition U - Architecture of the picture and picture of the architecture	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEPST0995	Architectural Research for Exchange Students - ST	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Architectural Research for Exchange Students on the topics of the Department's competency. The aim of the subject is to carry out a research on a special topic. The research contains specifying and processing the related international literature, summing up the findings in a study and finally a presentation. The language of the research depends on the consultant - the available topics are listed on the department's homepage.

Subject code	Subject name	Requirement	ECTS credit
BMEEPSTA205	Strength of Materials 1	Exam	6

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:10:15-12:00; TUE:12:15-14:00
Practice	EN1	English	WED:12:15-14:00

Subject code	Subject name	Requirement	ECTS credit
BMEEPSTG201	Fundamentals of Structures	Mid-semester mark	0

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	
Practice	EN1	English	

The aim of the subject is to get aquainted students with the profession of an archtectural engineer with emphasis on structures. After visits to a functioning building (the central building of the BME), to a material testing laboratory (that of the Department), to a construction site and an architectural design bureau, the experiences are treated in detail and discussed on the next lesson: what kind of requirements are to be considered by design, how to evaluate material strength test results, the collaboration of what kind of participants is necessary to design and construct a building.

Subject code	Subject name	Requirement	ECTS credit
BMEEPSTQ602	Special Load-Bearing Structures	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:12:15-14:00
Practice	EN1	English	TUE:10:15-12:00

Subject code	Subject name	Requirement	ECTS credit
BMEEPTCEP02	Interdisciplinary, Project based Design S	Mid-semester mark	16

Course type	Course code	Course language	Timetable information
Practice	EN2-ER	English	
Practice	EN1-ER	English	

The subject is based on the cooperation of the departments of the Faculty of Architecture. Students work in studios in groups with individual tasks as well instructed by teachers of the departments involved. There are two design

tasks to be solved during the semester, that can be chosen freely from the offered opportunities. Each task is to solve in seven weeks. Some of the tasks are: sport hall for Olympic Games in Budapest, Dwelling Underground, Suspension in Architecture, The Green in the Metropolitan Area (green walls, green roofs) etc.

Subject code	Subject name	Requirement	ECTS credit
BMEEPUI0901	Urban housing	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EN1	English	FRI:12:15-16:00

see moodle: https://edu.epitesz.bme.hu/course/view.php?id=702 The seminar is related to the Urban Housing LAB of the BME Department of Urban Planning and Design: http://urb.bme.hu/urbanhousing/ The objectives of this course are to introduce you to think critically about contemporary mass housing issues and solutions, to have an international comparison about the urban housing situation, and to make understand the complexity of mass housing development. As students arrive from different countries, the seminar uses the opportunity to learn from each other, to discover and compare several case studies. The five 4x45minute-long occasions are differentiated by geopolitical position and key topics: Introduction / urban housing terminology / comparative research method Post-Socialist Central European Countries / large housing estates Western European Countries / contemporary alternative housing solutions Post-Soviet Countries / homeownership USA / affordable housing

Subject code	Subject name	Requirement	ECTS credit
BMEEPUI0995	Architectural Research for Exchange Students - UI	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	

Architectural research for exchange and international students: with the professional leadership of the tutors of the Department of Urban Planning and Design students work on individual research topics (eg.. Urban History, Urban Tipologies, Urban Morphologies, Housing estates etc.). The course is based on individual work, with a final output of an essay.

Subject code	Subject name	Requirement	ECTS credit
BMEEPUIQ601	Department's Design 1.	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Practice	EN1-ER	English	THU:14:15-17:00

A special urban design course focusing mainly on urban public space design with the help of invited lecturers and landscape designer consultants. The course is a partly theoretical and partly practical where students get acquainted with special issues and problems of public space definition, basic notions and tools of public realm and public space design. In the design assignment students deal with a smaller spatial entity, where they start from the analysis of the urban problem and provide a possible solution for the publicly attainable zones in between buildings.

Subject code	Subject name	Requirement	ECTS credit
BMEEPUIQ702	Urban development: analysis, planning, management	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN1	English	WED:16:15-18:00

The course is a series of lectures of the eighth semester of the regular MSc curriculum and an elective course for Erasmus students, with 2 hours lecture weekly.The goal of the course is to get students acquainted with the multidisciplinary urban challenges due to the climate change, introduced by basic theoretical knowledge and illustrated with contemporary projects from all around the world. The semester will terminate by student’s power-point presentations, demonstrating the best practices from their home countries.

Subject code	Subject name	Requirement	ECTS credit
BMEEPUIQ704	Urban Activism / Community driven experiences in urban development	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Practice	EN1	English	

The elective course aims to teach students the practice of participatory design, focusing on urban public space design involving local communities. Students – after analysing the European best practices – will get experience in involving different social groups and interest-groups into the design process of a public space. The course is based on the results from the research on the possibilities to enhance the practice of participatory design done at the Urban Design and planning department. Students will get an extensive knowledge on the international practice of participatory design, reading much of its English literature, analysing completed European public spaces designed with this method. During the practical classes, the students will make a design proposal or activity process simulation for a selected public space in Budapest, either in a dense urban context or on the spaces of a housing estate, or in a suburban situation. A group work is expected to study the capabilities of the place, the different social groups present and the possibilities to involve these locals. Students will simulate the process of participatory design, will place themselves in the position of the locals, will work on strategies to grant the collaboration needed. The process will result in a series of rules needed to gain equal possibilities of action from all social groups on the site. Students will

map the real needs of locals, will get into interaction with their communities, and will find design tools to fulfil their needs. The first presentation will summarize the needs of the local groups, while the final presentation will show the finished results of the design process. Both presentations need to be handed in digitally the final grade is a result of the evaluation of both.

Subject code	Subject name	Requirement	ECTS credit
BMEEPUIQ705	Urban Landscape / Garden and Landscape Design in the Perspective of Architecture	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Practice	EN1	English	FRI:13:15-16:00

The urban landscape is an interdisciplinary theoretical concept in which the concepts of landscape, open space, and garden architecture appear in close symbiosis with architectural and urban architecture approaches. For this reason, interdisciplinary interpretations of the concept can be developed primarily in the interprofessional dialogue, from the comparison of different positions and visions. The aim of the subject is the complex interpretation of the concept of the urban landscape, the search for connections between the concepts of architecture, urban architecture and related disciplines. In its multi-scale methodology, the subject examines the interpretation of the urban landscape as both an ecological and social issue. During the semester, the emphasis is placed on the theoretical and practical problems of the urbanized landscape, interprofessional dialogue with invited specialist speakers, and joint site visits.The theme of the course analyzes the transformation along the three lines of "positions, visions, concepts", which can also be understood as a model of landscape theory, through which the urbanized landscape and the green areas and gardens appearing in the urban environment can be examined from the viewpoints of different disciplines (landscape architect, garden designer, urban architect, architect, etc.) , problems of parks. Contemporary horticulture and landscape architecture projects are presented by invited speakers, with particular attention to their practical experience gained during creative work. On each occasion, the theoretical perspectives of the urban landscape are shaped by a series of scale changes emerging from different concepts. The concept of the urbanized landscape appearing in the contemporary literature directs attention to the new qualitative dimensions that try to interpret the changes in territories that are becoming malleable, borders that are blurring, and territorial identities that are getting mixed up. The ever-changing, ever-changing landscape, the ever-stronger landscape-shaping role of humanity requires new approaches to the relationship between landscape and architecture.The motto of the subject also assumes the active participation of the students, in connection with the topic of the lectures, during the semester it is possible to present individual analyzes of the raised landscape problems. The core of the occasions is shaped by joint conversations and the discussion of different points of view arising in connection with the topics.

Subject code	Subject name	Requirement	ECTS credit
BMEEPUIQ801	Sustainable and livable city	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	
Practice	EN1	English	

Faculty of Chemical Technology and Biotechnology

IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully.Civil Engineering courses are on the website seperately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

Subject code	Subject name	Requirement	ECTS credit
BMEVEFAA409	Colloid Chemical Approach to Nanotechnology	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	A0-ER	English	TUE:14:15-17:00(F11Schay)

INTRODUCTION – THE MODERN HISTORY OF#160; COLLOID SCIENCE2.CLASSIFICATION OF COLLOID SYSTEMS2.1. Classification by the quality and structure of colloid particles2.1.1. Microphases2.1.2. Macromolecules2.1.3. Micelles2.2. Classification of the colloid systems by the network forming ability of the colloid nanoparticles2.3. Traditional significance of colloid systems3. #160;STABILITY OF DISPERSIONS3.1. Interpretation of the kinetic stability3.2. Surface electric properties of microphases3.2.1. Formation of surface electric charge3.2.2. Formation and description of the electric double layer3.2.3. Electrokinetic phenomena, zeta potential3.3.1. Electric double layer repulsion3.3.2. Dispersion (van der Waals) attraction3.3.3. Conclusions of the DLVO theory3.3.4. Coagulation kinetics and mechanism (basic concepts)3.4. Stabilization – destabilization with macromolecules and surfactants3.4.1. Macromolecules (polymers)3.4.2. Surfactants3.5. Structural colloid interactions3.6. Peptization3.7. Sedimentation of suspensions, structured suspensions#160;4.#160; PREPARATION OF DISPERSIONS4.1. Disintegration of macroscopic material ensembles4.2. Preparation of dispersions by condensation4.2.1. Nucleation in solutions (Preparation of lyosols)4.2.2. Homogeneous vapour phase condensation5.#160;CHARACTERIZATION OF SIZE AND SHAPE OF COLLOID PARTICLES#160;#160; #160; #160;5.1. Shape of particles5.2. Size of particles6.#160;TECHNIQUES FOR DETERMINING PARTICLE SIZE AND SHAPE#160;#160;6.1. Observing individual particles: imaging techniques6.2. Techniques yielding average particle size6.2.1. Sedimentation in gravitational field#160;#160;6.2.2. Sedimentation in a centripetal field6.2.3. Osmotic pressure of colloids6.2.4. Light scattering of colloid particles7. #160;RHEOLOGICAL BEHAVIOUR OF COLLOID SYSTEMS7.1. Basic concepts, types of ideal rheological behaviour, relativity of rheological behaviour7.2. Viscosity of dilute dispersions7.3. Intrinsic viscosity, molar mass of linear, neutral macromolecules7.4. Rheology of concentrated dispersions, pseudoplasticity, dilatancy, thixotropy8. INTERFACES#160;8.1. Liquid-gas interface, surface tension8.2. Curved liquid surfaces: capillary pressure, ageing of colloidal dispersions8.3. Liquid-liquid interface, cohesion and adhesion energies, spreading criterion8.4. Solid-liquid interface, wetting9.#160;ADSORPTION#160;9.1. Adsorption at liquid-vapour interfaces: surface tension of aqueous solutions9.1.1. Insoluble monomolecular films9.2. Adsorption at solid-gas interfaces 9.2.1. Characterization of porous adsorbents9.3. Adsorption at solid-liquid interfaces9.3.1. Non-electrolyte adsorption, mixture adsorption9.3.2. Adsorption of electrolytes at solid-liquid10.#160;ASSOCIATION COLLOIDS, MICELLES#160;10.1. Building blocks of micelles: amphiphilic molecules10.2. Micelle formation, critical micelle concentration10.3. Greatness of CM, Krafft- and cloud phenomenon, solubilisation10.4. Types of micelles: small- and large micelles, vesicles, liposomes and reverse micelles11.#160;FOAMS AND EMULSIONS#160;#160;#160; #160;#160;11.1. Foams11.2. Emulsions12.#160;COLLOID CHEMISTRY IN NANOTECHNOLOGY12.1. The evolution of nanotechnology12.2. Nanomaterials and their classification12.3. Nano-scaled self-assembly and growth12.4. Nanostructured coatings, nanomorphology, superhydrophobicityREFERENCES#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVEFAM110	Materials science: traditional structural materials and polymers	Exam	4

Course type	Course code	Course language	Timetable information
Laboratory	ENG_lab	English	MON:14:15-18:00(HF4)
Lecture	theory	English	TUE:12:15-14:00(HF2)

Materials science explores the relationship between the processing technology, structure and properties of materials in order to meet the requirements of specific applications. The goal of the course is to offer information about the structure, properties and behavior of the frequently used structural and functional solid materials. The subject demonstrates the importance of the design, production and shaping of materials and products through real-lie examples. The course discusses in detail the structure-property correlations of plastics, metals and ceramics, as well as solid structural and functional materials based on renewable resources. This course highlights also the similarities and important differences between the studied structural materials.
https://www.ch.bme.hu/oktatas/targyak/BMEVEFAM110/en

Subject code	Subject name	Requirement	ECTS credit
BMEVEFAM408	Plastics and the environmental protection	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	theory	English	FRI:13:15-15:00(HF2)

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The main goal of this subject is to introduce the environmental effects of plastics processing and application, the possibilities of decreasing the harmful effects, and the trends in development. 8.1. General questions of environmental protection. Sources of air, water and soil pollution. Role of plastics in the environmental strategy.8.2. Possibilities of waste reduction. Use of renewable resources and energy. Minimal use of natural resources. The role of plastics in the reduction of inputs from the economy and the environment.8.3. Sources of plastic wastes, possibilities and limits of recycling. General questions of collecting plastic wastes.8.4. Recycling plastics from communal waste (packaging materials).8.5. Recycling plastics used in electronics and vehicles, as well as by the construction industry.8.6. Chemical basis of plastics recycling. Mechanical recycling of homogeneous plastics.8.7. Mechanical recycling of mixed plastics.8.8. Chemical recycling of plastics: degradation, hydrolysis, alcolysis, pyrolysis. Incineration with energy recovery.8.9. Controlling lifetime of plastics by additives.8.10. Biodegradable polymers.8.11. Economy of waste management. Life cycle engineering of plastics, standards.8.12. Life cycle analysis of some plastics products.8.13. Legislation and directives concerning waste management.8.14. Waste management in Hungary. Possibilities for development.

Subject code	Subject name	Requirement	ECTS credit
BMEVEFKA304	Physical Chemistry I	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	A0-ER	English	MON:10:15-12:00(CH307); WED:10:15-12:00(CH302)
Practice	A1-ER	English	MON:10:15-12:00(CH307); WED:10:15-12:00(CH302)

The subject is part of the compulsory curriculum. It provides introductory theoretical and practical information about physico-chemical phenomena related to „equilibrium”. The thermodynamic state functions will be defined and their use in chemical engineering and biochemical engineering practices will be demonstrated. Multicomponent phase equilibria and chemical equilibria will be interpreted with the help of chemical potential. The rate of processes will be covered in Physical chemistry II.#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVEFKA603	Physical Chemistry of Surfaces	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	A06-ER	English	WED:08:15-10:00(F1MFK)

Fundamentals of solid/fluid interfaces. The qualitative description of the surface layer, the concept of surface excess. Thermodynamics of the interfaces, surface tension and interaction potential. Interactions at solid/gas and solid/liquid interfaces. Adsorption isotherms, their interpretation (Langmuir, BET, Dubinin-Radushkevich and DFT models). Experimental methods, including calorimetry. Particle size analysis. Applied surface science: the role of interfaces in material science, environmental and industrial processes. Heterogenous catalysis, Pressure/Temperature Swing Adsorption

Subject code	Subject name	Requirement	ECTS credit
BMEVEKFA203	Chemical Technology	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	elm_ENG_ER	English	MON:12:15-14:00(CH307)

The aim of the course is to introduce the fundamentals of chemical technology and its role in the chemical, petrochemical, pharmaceutical, electronic and energy industries. Demonstrate the role of chemical, petrochemical, and pharmaceutical industries in the world. Identify key concepts of catalysis used in technology. Introduce the fundamentals of chemical engineering. Review the production and storage of energy.#160; Describe the most important raw materials. Discuss the chemical processes related to water and including corrosion. Identify the most important inorganic products and their production technologies.#160; Overview synthetic fuels, C1-chemicals and other organic products as well as the technologies for their production. Identify key concepts of biotechnology and demonstrate their applications.1. The role of chemical technology in the World ant the fundamentals of chemical technology. 2. Catalysis in chemical technology. 3. Fundamentals of chemical engineering. 4. Energy production. 5. Water. 6. Raw materials. 7. Inorganic chemicals. 8. Energy storage. 9. Synthetic Fuels. 10. C1 chemicals. 11. Organic chemicals. 12. Plastics and microplastics. 13. Agrochemicals. 14. Biotechnology.

Subject code	Subject name	Requirement	ECTS credit
BMEVEKFA403	Environmental Chemistry and Technology	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	elm_ENG_ER	English	THU:14:15-17:00

Understanding of the formations, possible reactions of environmental polluting materials.The students becomes familiar with the chemistry of pollutants in the air, water and soil.The main chemical and physico-chemical processes in the atmosphere, hydrosphere, lithosphere and biosphere will be discussed. Chemical basis and the effects of the environmentally harmful materials on the living and non-living objects will be presented as well.The students will be able to identify contaminants resulting from technological processes. They learn about the modern technological processes reducing the harmful emissions decreasing the environmental degradation.#160;1. week: Introduction and detailed description of the subject's objectives, some thoughts on the causes of environmental pollution. Development and the present composition of the atmosphere and hydrosphere. Dobson unit, formation of hydroxyl radicals.#160;2 week: The main groups causing pollution: airborn and waterborn pollutants#160;Airborn pollutants: carbon dioxide, nitrogen oxides, sulfur oxides, hydrocarbons, halogenated hydrocarbons, dioxines and photochemical oxidants, particulates.Chemical properties and ways of formation and/or elimination of environmental polluting materials, the reaction kinetics, and control methods of these processes will be discussed in the following lectures as well.The natural and anthropogenic sources of carbon monoxide. Formation of CO from methane and elimination from the atmosphere. Technological possibilities to reduce emission.#160;3. week: The origin and kinetic of#160; the formation of nitrogen oxides, NOx #160;(NO, NO2, N2O and short live forms), the photocycle of#160; nitrogen-dioxide, ozone formation in the lower atmosphere. The effects on plants, animals, humans and on structural materials#160;4. week: Sulfur oxides originated naturally and from human activities. The kinetic of#160; the formation of different SOx. The chemical effects of acidic rains. The technological possibility of decreasing SO2 formation.#160;5. weeks: hydrocarbons and photochemical oxidants. London type and photochemical smog.#160;Hydrocarbon decreasing technologies.#160;6. weeks: Formation of halohydrocarbons , Ozone –hole, , Dioxins (TEF, TEQ), Dioxin decreasising technologies.#160;7. weeks: Particles, aerosols, smog, fog. Chemical composition and size distribution of particles. The effects of particles on the living systems. Meterological aspects of air-pollutants.Particle elimination technics.#160;8. weeks: Global warming, greenhouse effect, possible causes of periodical climate changes.#160;9. weeks: Future and energy , Bioenergy, biodiesel, bioethanol,10. weeks: Waterborn pollutants: organic materials, toxic organic materials, plant nutrients, mineral oil and fractions, detergents, pesticides and toxic metals.High oxygen demand wastewater, aerob and anaerob fermentation#160;11. weeks: High oxygen demand and toxic wastewater. Oil spills, environmental effects, decontamination technologies#160;12. weeks: Plant nutrient-containing wastewater,#160;13. weeks: Detergent-containing wastewaters, the properties and types of detergents, their#160;#160;#160;#160;#160; #160;#160;#160;#160; environmental effects.#160;14. weeks: Pesticides, groups of pesticides, DDT, the new, third generation pesticides#160;#160;#160;#160;#160; Discussion and summary. Results#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVEKFM105	Chemical Process Design and Control	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	elm_ENG_ER	English	THU:08:15-10:00(F212)

Chemical process design, priciples, tools. Algorithmic and heruistic desigm. Hierarchical strategy. Levels of the hierarchical design. Batch process design and scheduling. Pinch technology. Industrial process control. Control of chemical engineering units, processes.The chemical and similar processes consist of several elements, basically unit operations. The design and operation of chemical processes is a complex activity. It is based on the exhaustive knowledge of the unit operations and the basics of process control. It is necessary to know the description, modeling, design, and operation of continuous and batch processes consisting of several elements. Such higher level of knowledge must be supported with systems engineering knowledge and process control knowledge of higher level, that means the control structure design and control of multiple input and multiple output chemical systems. System oriented investigation, modeling, design, and operation are needed. Integrated process design is focusing on the energy, environment, and operation. Professional flowsheeting packages help such activities. their use is also part of the subject.The modern control principles are also taught: robust control, MIMO control, model based control, etc#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVEMBM301	Biology, biotechnology	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	A10	English	WED:14:15-16:00(CH308)

The subject gives an overview of the modern biotechnology focusing on some exciting territories of biotechnologies of chemical industrial and engineering interest. After giving an introduction into cell biology and microbiology the subject concentrate on the possibilities of white end green biotechnologies as well as give a scope on the most important special bioindustrial unit operations and environmental bio-solutions.1.#160;#160;#160;#160;#160; Introduction, colors of biotechnology, special features of biotech: de novo fer-men-tations and

biotransformations.2.#160;#160;#160;#160;#160; Cell biology summary: cell structure and function3.#160;#160;#160;#160;#160; Microbiology and physiology survey: kinds of industrial microorganisms, their biochemistry: aerobes és anaerobes, basic microbial metabolic paths.4.#160;#160;#160;#160;#160; Introduction to enzyme engineering. Enzyme kinetic models, types of enzyme inhibition5.#160;#160;#160;#160;#160; Immobilized enzymes, analytical application of enzymes6.#160;#160;#160;#160;#160; Techniques and unit operations applied in bio-industries: cultivation methods of microorganisms, culture media, sterilization, 7.#160;#160;#160;#160;#160; Bioreactors: aeration, mass transfer.8.#160;#160;#160;#160;#160; Typical technologies: production of primary and secondary metabolites, recombinant proteins.9.#160;#160;#160;#160;#160; Case study technologies: lysine, penicillin, HB vaccine10.#160; Special methods of product isolation and purification: cell disruption, affinity (bio-specific) methods.11.#160; Some examples in white and green biotechnology: ethanol, citric acid, lactic acid fermentations, etc., biotransformations (semisynthetic antibiotics, enzymatic resolution methods) 12.#160; Biotechnological waste water treatments: removal of organic materials, 13.#160; Removal of phosphorus and nitrogen.Nitrification and denitrification#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVESAA208	Inorganic Chemistry	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	A14-ER	English	WED:13:15-16:00(CHFSEKÖ)

Definition of the subject of inorganic chemistry. General discussion of the properties of the elements, and their reactivity with air, water, acids and bases. Thermodynamic and kinetic considerations. Thermodynamical and kinetical control of the#160; reactions. #160;Reactivity of the elements with water, bases and acids. Generalizable guidelines for the synthesis of the elements. Trends in the periodic system. (4 hours)Main group elements and their compounds#160;Hydrogen, and hydrides. Physical and chemical properties of hydrogen. Industrial synthesis. The quest of the hydrogen economy. Classification, reactivity and use of #160;hydrides. (2 hours) Noble gases, Physical properties, production, usage. #160;Noble gas compounds.#160;Halogenes. Physical and chemical properties. Industrial synthesis of fluorine and chlorine. Brine electrolytic procedures and their comparison. (2 hours)Chlorides and their classification. Chalcogens. Physical and chemical properties of oxygen, ozone and sulfur, selenium and tellurium. Sulfuric acid production.#160; Oxides and sulphiodes and their classification. #160;(2 hours)Physical and chemical properties of nitrogen. The chemistry of the industrial synthesis of ammonia. Nitric acid. The allotropes of phosphorus. Phosphorus oxides and halides and sulphides, phosphoric acid, phosphinic acid. (3 hours)The allotropic modifications of carbon, diamond, graphite, graphene, nanotubes, fullerenes. The chemistry of carbon, carbides. The physical and chemical properties of silicon and germanium. Differences from carbon. Silicates, organosilicon compounds. Tin and lead. Chemistry, physical properties, synthesis. (3 hours)Boron and boron compounds. Specific bonding in boron compounds. The physical properties and application of alumínium. The chemistry of aluminum. The chemistry of the production of aluminum. Aluminum oxides. Alkaline earth metalls, Alkaline metalls.(2 hours)Transition metals and their general properties: magnetic properties, spectra, complexing ability. The early transition metals (scandium group, titanium group, vanadium group. (2 hours)Chromium group. Physical properties of the elements and their use. The chemistry of the +3 and +6 oxidation states. Complexing properties in the +3 and zero oxidation states. The eighteen electron rule. Manganese and its oxidation states. (2 hours)Iron, cobalt and nickel. Magnetic properties. Iron containing complexes. Stability. The +2 and +3 oxidation states of iron. Complexes, and complex stabilities with different ligands. The chemistry of steel production. Carbonyl complexes of Fe, Co and Ni, and their use. Lighter and heavier elements of the platinum group. Square quadratic complexes. Interstitial hydrides and catalytic hydrogen activation. (2 hours)Copper group. Physical and redox properties. Gold. Complex formation. Oxidation states. Production and use#160; of the elements. The zinc group. Physical properties. #160;Organic compounds and toxicity, long time effects. F-elements, Lanthanides: Lanthanide-contraction and consequences on d-element properties. (2 hours)#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVESAA403	Analytical Chemistry Laboratory Practice	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	A17L	English	WED:14:15-18:00(CHFLAB)
Lecture	A17	English	WED:14:15-18:00(CHFLAB)

Volumetric analysis:- Organization of the working groups#160;(4 h)- General introduction to the goals of the course and to the analytical tasks to be performed during the semester; laboratory safety handling of chemicals waste; general introduction to the tools of trade.- Precipitation titration: determination of Cl- ion by Mohr's method.#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; - Precipitation titration: determination of Br- ion by Volhard's method.Complexometric titration: #160; (4 h)-determination of Ca2+ and Mg2+ ions by EDTA titration; -determination of Pb2+ ions.#160;#16

0;#160;#160;#160;#160;#160;#160;#160;#160;#160; Acid-base titration:(4 h)- preparation and standardization of the titrant (HCl solution)- analysis of Na2CO3 and NaHCO3 using Warder’s method; preparation and standardization of NaOH titrant.Acid-base titration: #160; (4 h)-#160; determination of weak acid CH3COOH. #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; Redox titrations:#160;- Oxidation with potassium permanganate. Preparation and standardization of KMnO4 titrant. Determination of the concentration of NO2- ions by titration with KMnO4.#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; - Iodometry: preparation and standardization of Na2S2O3 titrant. Determination of the concentration of Cu2+ ions.#160; Bromatometry: Quantitative determination of phenol by Koppeschaar’s method.#160; (4 h)Make up opportunity for missed or failed volumetric analysis tasks#160; #160;#160;(4 h)#160;#160; #160; #160; #160; #160; #160; #160; #160; #160; #160; #160; #160; #160; #160;Oral exam #160; #160; #160;(2 h)Instrumental analysis:Electroanalysis: - pH measurements with combined glass electrode; - quantitative determination of F- ions in toothpaste by fluoride ion-selective electrode; - quantitative determination of Fe(II) by cerimetric titration using potentiometric endpoint detection, - quantitative determination of Cl- ion concentration in tap water by precipitation titration using conductometric endpoint detection.#160;#160;(4 h) #160; #160; #160; #160; #160; Gas chromatography: - demonstration of capillary columns, - qualitative analysis of unknown organic mixture using Kovats retention index- quantitative analysis of an unknown organic mixture-demonstration of the GC-MS method and instrument.#160;#160;(4 h)#160; #160; #160;#160; #160;#160;#160;High performance liquid chromatography:- quantitative analysis of caffeine content of soft drinks using RP-HPLC method. - determination of the parameters characterizing the efficiency of separation#160; #160;(4 h)Immunoassay: - quantification of alfa-fetoprotein (AFP) in blood serum by enzyme-linked immunosorbent assay (ELISA)#160; #160; (2 h)Fluorimetry: - determination of quinine from a soft drink.#160; #160; #160;(2 h) Atomic absorption spectroscopy, optical emission spectroscopy: - Quantitative analysis of Mn, Fe from limestone samples by flame atomic absorption spectroscopy (flame-AAS) - Quantitative analysis of Na by flame atomic emission spectroscopy (FAES).#160; #160; (4 h)UV-Vis spectrophotometry: - Spectrophotometric determination of NO2- content in tap water using the sodium salicylate method.#160;(#160;4 h)Make up opportunity for missed or failed instrumental analysis tasks #160;#160; (4 h)Oral exam #160; (2 h)#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVESAM101	Complex and Inorganic Chemistry	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	A16-ER	English	TUE:14:15-16:00(CH306)

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The aim of the subject is to give a general knowledge in the field of the organometallic chemistry (classifications, structure, stability, reactivity) and give more detailed information about the industrial applications of these compounds. The lectures have been structured in the traditional way – following the periodic table for the main-group element organometallics (alkali, alkali-earth, aluminum, tin, lead and silicon will be discussed more detailed) and according to the nature of the ligand for transition-metal complexes. At the end of the

course the industrial applied catalytic reactions (Heck, Suzuki, etc.) will be discussed. 1.Milestones in organometallic chemistry, classification of organoelement compounds, coordination number, structure, nomenclature, ligand-exchange reactions, stability of complexes; chelate effect and its analytical applications. Isomerism. Biochemical aspects of complexes. 2.The nature of M-C bond, (VB-, Ligandfield- and MO theory), structure (coordination number, hapticity, isomerism), Jahn-Teller effect. Magnetic behavior and color of the complexes. 3.Brief history of the organoelement compounds. General characterization of organometallic compounds: classification, polarity and reactivity of the M-C bond, definition of stable, labile and inert. Overview of preparation methods of organometallic compounds. Organolithium compounds (preparation, structure and degree of association in solid phase and in different solvents, reactivity). 6Li- and 7Li-NMR spectroscopy, EPR spectroscopy. 4.Organometallic compounds of heavier alkali metals. Organometallic compounds of group 2 and 12 (beryllium, magnesium, zinc, cadmium, mercury). Preparation, structure, properties, reactivity and applications. (Schlenk-equilibrium, Grignard reagents). Organoboron compounds (2e3c bond, hydroboration) 5.Organoaluminum compounds. Preparation, structure, properties, reactivity and applications.Organoelement compounds of group 14. (silicon, tin and lead). 119Sn-Mößbauer and 119Sn-NMR spectroscopy.Organometallic compounds of transition-metals according to nature of the ligand. 6. s-Donor ligands. Preparation of transition-metals alkyl and aryl compounds. Properties of transition-metals s-organyls: thermodynamic stability and kinetic lability, interactions of C-H- and C-C- s bond with transition-metals. 7.s-Donor/p-acceptor ligands. Transition-metal Carbene and Carbyne complexes. Metal carbonyls (Preparation, structure, properties). 8. s,p -Donor/p-acceptor ligands. Olefin-, alkyne- and allyl-complexes. C5H5- and C6H6 ligands and their complexes. 9.Metal-metalbonds in transition-metal clusters. 10. Organometallic catalysis in synthesis and production. principles. Laboratory and industrial applications. Olefin Isomerization. C-C coupling reactions. C-heteroatom coupling reactions. Olefin oxidation. Carbonylation of Alcohols. Hydroformylation. Oligomerization and polymerization of alkanes and alkenes.

Subject code	Subject name	Requirement	ECTS credit
BMEVESAM301	Computational Chemistry	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	A-13-ER	English	MON:09:15-12:00(CH308)

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Aim of the subject: The subject gives an overview about the principles used to describe the structure of molecules and bulk phases. The modeling of physico-chemical parameters, chemical processes will be presented together with the usual techniques. Practical examples for the solution of chemical- and physico-chemical problems by computer modeling will be done during the course. Short syllabus of the subject:A./ Lecture1./ Basic principles of quantum mechanics: The axioms, the hydrogen atom, the Born-Oppenheimer approximation, the independent particle model, and the MO theory. Hierarchy of the theoretical models: Molecular mechanics, semiempirical, Hartree-Fock and post HF methods. Oniom and QM-MM methods. Density functional methods. The concept of the electron density. 2./ Application possibilities. Energy and electronic structure of atoms and molecules. Computation of measures related to physico-chemical or chemical concepts. Molecular geometry, conformation, conformational space. Modeling chemical reactions, thermodynamics and transition structures. Large systems, solutions and crystal structures. Molecular dynamics. B./ Practice and problem solving1./ Molecular geometry. Building of molecular structures by program packages. Geometry optimization by molecular mechanics (Isis draw, Hyperchem and Spartan packages.)2./ Energy -hypersurface and conformational problems (Spartan). 3./ Ab initio computations. Basis sets. Molecular Orbitals. Electron density maps. (Spartan package).4./ Computation of molecular and thermodynamic properties (individual molecules, chemical processes in the gas phase, solutions. The use of the Gaussian package.

Subject code	Subject name	Requirement	ECTS credit
BMEVESKA504	Organic Chemistry III	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	A10	English	WED:08:15-10:00(CH204)

Based on the knowledge of subjects Organic Chemistry I and II, this subject puts major emphasis on all aspects of chemical problems associated with chiral compounds. By systematic classification of all major stereochemical terms and stereoselective syntheses, this subject adds solid knowledge to the existing understanding of organic chemistry for the future chemical engineers of pharmaceutical and fine chemicals industry. Short syllabus of the subject: Stereochemistry, the stereostructure of organic compounds:Constitution, configuration, conformation and the order of chemical bonds. Chirality and symmetry elements. Configuration of stereocenters and bonds. Chiral and achiral conformations and molecules. Constitutional and stereoisomers. Enantiomerism and diastereomerism. Enantiomeric and diastereomeric conformations and molecules. Symmetry of groups and faces: diastereotopic, enentiotopic and homotopic relations. Physical and chemical requirements of enantiomerism: stereoselective and stereospecific reactions, optical activity. Relative and absolute configuration. Optical inactivity of the achiral molecules. Substitution

reactions at centers of asymmetry: inversion, retention, racemization. Racemic and mezo compounds. Atropisomerism. Nitrogen inversion. Center of asymmetry, axis of asymmetry, pseudoasymmetric centers. Dynamic properties. Tutomerism. Effects influencing tautomeric equilibria. Types of tautomers. Mutarotation. Asymmetric synthetic methods Definition and classification of stereoselective transformations. Background and methods of enentiomeric composition determination. Enantiomer selectivity. Principle of resolution. Chiral reagents and catalysts. Kinetic resolutions by biological systems. Dynamic kinetic resolutions by biological systems. Basics of diastereotopic and enentiotopic selectivity. Basic principles of asymmetric reactions by chemical and biological systems. Stoichiometric and heterogeneous catalytic asymmetric reactions. Asymmetric reactions by homogenous catalytic systems and by biological systems. Asymmetric reactions of industrial importance.

Subject code	Subject name	Requirement	ECTS credit
BMEVESTA411	Organic Chemical Technology	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	34a	English	MON:10:15-12:00(CHA10)

Introduction, the sectors of organic chemical industry and the trends of their advancements in the last decades, the parts of chemical processes.Organic chemical conversions applied frequently in industry, the 40 intermediers and solvents manufactured in the largest amount (US Top 40).Main reactor types (multi purpose stirred vessel reactor, tubular reactor, autoclave, fluidized bed reactor, filmreactor) and typical work-up procedures (evaporation, fractionation, filtration, recrystallization, centrifugation, drying).Connection and fitting of the parts of chemical processes, batch and continuous flow technologies, controlling, flowchart, layout of a plant hall, structures of chemical factories. 4 hFamily tree of aromatic compounds (intermediates synthesised from benzene, toluene and xylenes by substitution, addition or oxidation), starting materials derived from ethylene and propylene (styrene, vinyl chloride, acetaldehyde, cumene, phenol, cyclohexanone and caprolactam), methane, methanol and formaldehyde as important starting materials (manufacture of acetic acid, chloromethylation, hydroxymethylation, Mannich reaction) monomer and intermediate industry, fine chemical industry.#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160; 5 hDetergent and surfactant industry, alphenes and alphols as important base materials for detergents, surfactants prepared from hydrocarbon by sulphonation, sulphatation, sulphoxidation or sulphochlorination, sodium dodecylbenzene sulphonate, components of soaps and washing powders, environmental aspects.#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#1 60;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160; 3 hPesticide industry, basic terms, chemical plant protection by insecticides, fungicides, herbicides, naturally occurring active substances, permethrines, pyrethroides, carbamates and ureas, carbonic acid derivatives derived from phosgene, organic phosphorus compounds and their syntheses, heterocyclic compounds (e.g. triazines), phenoxyacetic acids, avoiding environmental problems through the examples of DDT and dioxins.#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160; 4 h#160;Pharmaceutical industry, features of this industrial sector, scale-up, flowchart, process flow diagram, the most frequently applied conversions and appliances in the pharmaceutical industry and their connections to each others, showing the attributes of processes through some examples such as syntheses of several heterocyclic compounds (barbiturate/isoquinoline or phenothiazine/ benzodiazepine), as well as that of a salycilate, phenol and sulphonic acid derivative, aspects of the selection of solvents, quality assurance (GMP) as a part of technology, environmental considerations.#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160 ;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; 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#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#1

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Subject code	Subject name	Requirement	ECTS credit
BMEVESZA401	Organic Chemistry II.	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	A13	English	TUE:10:15-13:00(CH305)

Part I. Chemistry of special families of compounds6.1. Reactivity of carbonyl groupReactivity of compounds containing a carbonyl group.#160;(3 h)6.2. Derivatives of carbonic acidDerivatives of carbonic acid: chlorides, esters, urethanes. Urea and its derivatives. Carbon disulfide, xanthogenates, thiourea and its derivatives. Isocyanic acid, isothiocyanic acid and their derivatives. Cyanamide, carbodiimide, guanidine and their derivatives. #160;(3 h) 6.3.Diazomethane, azo-, diazo-, diazonium and related compounds Preparation and reactions of diazomethane and aromatic diazonium salts. #160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; Sulfur- and phosphor-containing compounds Thiols, sulfides, sulfonium salts, sulfoxides, sulfones, sulfonic acids. Phosphines,phophonium salts and phosphine oxides. The Wittig reaction.#160; #160;(3 h)6.4. Halogen, hydroxy and oxo acids and their derivativesPreparation and reactions of ?-, ß-, ?-, and ?- substituted halogen, hydroxy, and oxo acids and their derivatives.(3h)#160; #160; #160;#160;
#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#1
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#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; #160; #160; #160; #160; #160; #160;6.5. Malonic acid ester and acetoacetic ester synthesesPreaparation and using of acetylacetone, malonic acid ester and acetoacetic ester in organic synthesis.Biological important hydroxy and oxo acids. Formation and degradation of saturated fatty acids in living organism. (3 h)#160; #160; #160;#160; #160;#160;Part II. Lipids, amino acids, peptides, proteins, carbohydrates6.6. LipidsMain groups of biomolecules, their function in living organism. Types of lipids. Function of simple and complex lipids in living organism. Structure and function of terpenes and compounds containing steroid skeleton in living organism.StereochemistryEffects of chirality, optical rotation, ORD. The Emil Fischer D/L convention. Compounds containing more than one chiral centers, meso compounds, pseudo asymmetry. (3 h)6.7. Stereoselective reactionsTypes and rationalization of asymmetric reactions. Resolution. (1.5 h)Test 1. #160; #160; #160;(1.5 h)6.8. MonosaccharidesAliphatic and lactol ring structure of monosaccharides, mutarotation. Aldose-ketose conversion. Reduction and oxidation of monosaccharides, sugar alcohols, sugar acids. Formation, degradation and reactions of monosaccharides. Srtucture and function of ascorbinic acid. #160; #160;(3 h)6.9. Oligosaccharides, polysaccharidesStructure, occurence and synthesis of oligosaccharides. Structure and occurence of polisaccharides.Amino acidsStructure, physical and chemical properties, biochemical function of amino acids. Abbreviations according to convention. Synthesis of amino acids. #160; (3 h)6.10. Peptides and proteinsStructure of peptide bond. Synthesis of peptides, protecting groups and coupling methods, solid-supported chemical synthesis. Classification and biochemical function of proteins. Primary, secondary, tertiary and quarternary structures of proteins. The Ramachandran diagram. (3 h) #160;#160;Part III. Polycyclic aromatic compounds, heterocyles nucleic acids.6.11. Condensed and isolated polycyclic aromatic compounds, heterocyclesStructure, aromacity and reactions of naphthalene, anthracene, phenanthrene, fluorene. Chemichal properties, derivatives and reactions of diphenyl- and triphenylmethane.(1.5 h)Test 2. #160; #160;(1.5 h)6.12. Synthesis of heterocycles, five-membered heterocyclesPreparation of heterocycles. Structure, aromaticity and chemical reactions of furan, pyrrole and thiophene. Biochemical function of porphine skeleton. Structure, aromaticity and chemical reactions of azoles. #160; #160;(3 h)#160; #160; #160; #160; #160;#160;
#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#1
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60;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160;#160; 3 h6.13. Six-membered heterocyclesStructure, aromaticity and chemical reactions of pyridine, diazines and their derivatives. Synthesis of papaverine.NucleotidesPreparation of bases of nucleic acids. Structure and chemical reactions of NAD+ (niacinamide) and FAD (vitamin B2). #160;#160;#160;#160; (3 h)#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVESZA403	Medicines	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	11a	English	TUE:08:15-10:00(F2M012)

Introduction, short hystory of medicins and drug discovery. Fundamental conceptions in medicinal chemistry. Rules of drug research and production: preclinical and clinical development, GLP, GMP, role of FDA and other offices. -#160;Biological molecules: amino acids, peptides and proteins, carbohydrates, lipids, nucleic acids.-#160;Routes of drug administration: methods of extravascular and intravascular administration. Methods to influence of the duration of biological effect (retardation, special methods). -#160;The pharmacokinetic phase: role of adsorption, distribution, metabolism and elimination (ADME) properties in drug action.-#160;Dose/biological effect relations: single oral dose, repeated oral doses. Calculation of safety parameters of drugs (ED50, LD50, TI, CSF, SSM). Selectivities of biologically active compounds, effects and side effects.-#160;Time dependent exchange of bilogical effects of drugs: habituation, addiction, sensitivity and allergic reactions. Drug-drug interactions: synergism, antagonism. -#160;Absorption and distribution of drugs: diffusion, carrier aided absorption, biological pump mechanisms. Determination of drug distribution.-#160;Effects of the drugs on the human body: drugs with physical or physico-cemical effects. Type of chemical bonds between a drug and the biological target molecule: reversible and irreversible connections. Affinity and specific activity. Multipoint interactions: role of stereochemistry in drug action.-#160;Drug metabolism: phase I metabolitic reactions (oxidation, reduction, hydrolysis, hydration) and phase II reactions (conjugations).-#160;Drug metabolism and drug design (prodrugs, active metabolites, etc).-#160;Elimination of drugs and metabolites. Renal elimination, role of the liver in elimination. (Enterohepatic cycle, reabsorption in kidney). -#160;An introduction to drug discovery: solubility and drug design. Hansch parameter, electronic and steric effects. QSAR approaches, computer aided drug design, methods for preparation molecular libraries and HTS methods.-#160;Selected examples of drug action at some common target areas:#160; Antibacterial and antifungal agents. Antiinflammatory agents (steroids and nonsteroid type antiinflammatory agents). Opioid type analgesics.#160;

Subject code	Subject name	Requirement	ECTS credit
BMEVESZM101	Organic Chemistry	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	A15	English	THU:10:15-13:00(CH302)

.cs9880FCB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs5CC07D4{margin:12pt 0pt 12pt 0pt;text-align:left;text-indent:0pt} .cs98231CB{font-size:11pt;font-weight:bold;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;} .cs1EDC4FB{font-size:11pt;font-weight:normal;color:#000000;background-color:transparent;font-style:italic;font-family:Times New Roman;} .csA084A84{margin:0pt 0pt 0pt 0pt;text-align:justify;text-indent:0pt} .cs9885FCB{font-size:14pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Times New Roman;}

Aim of the subject is to get deep insight in organic chemistry at an advanced level. 1.) Structure of organic molecules. VSEPR and VB theories. Rationalization of chemical bonding using hybridization, conjugation, hyperconjugation, inductive and mesomeric effects. Molecular orbitals. Hückel MO theory. Symmetry of molecular obbitals. Frontier molecular orbitals. Rationalization of chemical bonding by molecular orbitals.2.) Pericyclic reactions. Cycloaddition and cycloreversion. Diels-Alder reaction. Dipolar cycloaddition. Woodward-Hoffmann rule. Sigmatropic rearrangements. Electrocyclic (ring closing and ring opening) reactions. Sigmatropic hydrogen shifts. Thermal and photochemical reactions. Reactions accompanied by rearrangements.3.) a.) Configuration and conformation. Chirality, symmetry elements. Static and dynamic stereochemistry. Prochirality.b.) Thermodynamics and kinetics of organic reactions. Kinetic isotope effects.c.) Properties of acids and bases, pKa and pKb values. Hard and soft nuclephiles and electrofiles. Ambident nucleophiles. Orbital controlled and charge controlled reactions.Kornblum's rule.4.) a.) Factors influencing aliphatic and aromatic nucleophilic substitutions. Stereochemical questions.b.) Elimination (? and ß, respectively) reactions. Preparation of carbenes, ylides and olefines. Regio- and stereoselectivity.5.) a.) Electrophilic addition to olefines, diolefines and acetylenes. Regio- and stereoselectivity.b.) Electrophilic aromatic substitution. Effects of the substituent and substituens, respectively in the aromatic ring for the rate of the reactions. Rationalization of the orientation effect of the substituents.6.) a.) Nucleophilic addition and nucleophilic addition-elimination to carbonyl group and conjugated oxo-compounds, respectively. Factors influencing reactivity.b.) Tautomerism of oxo-compounds and their analogues. Reactions proceeding through enols and enolates, respectively as intermediates.7.) Reactivity of carboxylic acids, carboxylic and carbonic acid derivatives. Acylation mechanisms. Comparison of acylation abilities of carboxylic acid derivatives8.) Preparation and synthetic applications of organic radicals. Reactions proceeding through radicals and radical anions, respectively as intermediates. Radical, anionic and cationic polymerizations. Polycondensation reactions.9.) Applications of protecting groups in chemical synthesis. 10.) Using of easily available natural enantiopure compounds (chiral pool) (amino acids, sugars, hydroxy acids, alkaloids etc.) for the preparation of optically active materals. Bio- and chemocatalysis, regio- and stereoselectivity. Applying enantioselective methods for the preparation of compounds containing more than one chiral centers.11.) Synthetic applications of organic boron-, sulfur- and phosphorus

compounds. Organometallic compounds in organic synthesis. Preparation and applications of organometallic compounds of alkali (Na, Li) and alkaline earth (Mg) metals. Organometallic compounds of zinc and copper. Reactions catalyzed by palladium (II) and palladium (0).12.) Using heterocyclic compounds in organic synthesis.13.) Special techniques in organic synthesis. Microwave-assisted synthesis. Solid-supported chemical synthesis. Basics of combinatorial chemistry.Theory and applications of molecular recognition including enantiomeric recognition in analytical chemistry and separation techniques.

Subject code	Subject name	Requirement	ECTS credit
BMEVEVMA504	Chemical Process Control	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Laboratory	lab_EN_ER	English	THU:12:15-14:00(DFcsarnok)
Lecture	elm_ENG_ER	English	MON:14:15-16:00(F211)
Practice	gyak_ENG_ER	English	THU:12:15-14:00(DFcsarnok)

Why to control? History of the control. The role of a chemical and/or biochemical engineers in a team that designs control for a plant or unit operation.#160;Feed back and feed forward control. Their comparison.#160;The „languages” of the control science, theory, differential equation – time domain; trandfer function, Laplace transformation, Laplace domain; frequency function, frequency domain, Nyquist diagram, Bode diagram.#160;Single input single output (SISO) systems.#160;Typical mathematical models in the process control study.Typical test signals. Their correlation, Transfer function, frequency function.Proportional unit, dead time element, first order unit. Their differential equation, transfer functions, responses to typical test signals. Frequency functions.Examples for first order elements. Thermometer, heat exchanger, buffer vessel, chemical reactor (CSTR)Determination of the parameters of a first order unit, time constant and process gain. Methods for the determination of the time constant.Second order elements. Examples, differential equation, transfer function, responses to typical test signals. Demonstration of the effect of elements in series. Damping coefficient, classification of second order units.#160;Higher order elements, their representation.#160;Integral unit, derivative unit.#160;Controllers, Switch on-off controller, P,I, D controllers. Characterization f the P, I and D controllers, their models, features,#160; functions, area of application.#160;Controller tuning methods.#160;Basic controls, flow control, level control, transmitters, case studies,Actuators, control valves, characteristics.#160;Control of unit operations.#160;Control of evaporators, pairing of manipulated and controlled variables.Control of rectification columns. Control structure, pairing at different kinds of rectification, sensor location, manipulated variables.#160;

Faculty of Civil Engineering

IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully.Civil Engineering courses are on the website seperately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

Subject code	Subject name	Requirement	ECTS credit
BMEEOAFAT42	Surveying II.	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:10:15-12:00(KM26Olt); THU:10:15-12:00(KM26Olt)
Practice	EN6	English	FRI:10:15-12:00(KF27k); FRI:10:15-12:00(KF27k)
Practice	EN4	English	THU:14:15-16:00(KF27b); THU:14:15-16:00(KF27b)
Practice	EN5	English	FRI:08:15-10:00(KF27k); FRI:08:15-10:00(KF27k)
Practice	EN1	English	TUE:14:15-16:00(KF27b); TUE:14:15-16:00(KF27b)
Practice	EN3	English	THU:14:15-16:00(KF27k); THU:14:15-16:00(KF27k)
Practice	EN2	English	WED:08:15-10:00(KF27b); WED:08:15-10:00(KF27b)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOAFMB51	Numerical Methods	Exam	4

Course type	Course code	Course language	Timetable information
Practice	EN1	English	THU:14:15-16:00(KF27c); THU:14:15-16:00(KF27c)

Subject code	Subject name	Requirement	ECTS credit
BMEEOAFMF-1	Theory and Application of GNSS	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:08:15-10:00(KF27a); MON:08:15-10:00(KF27a)
Practice	EN1	English	MON:10:15-12:00(KF27c)

Subject code	Subject name	Requirement	ECTS credit
BMEEOAFMF-2	Automated Survey Systems	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:12:15-14:00(KF27a)
Practice	EN1	English	THU:10:15-12:00(KF27a); THU:10:15-12:00(KF27a)

Subject code	Subject name	Requirement	ECTS credit
BMEEOAFPRE4	Basic Surveying	Mid-semester mark	0

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:10:15-12:00(KF27b); WED:10:15-12:00(KF27b); FRI:08:15-10:00(KF27b); FRI:08:15-10:00(KF27b)

Subject code	Subject name			Requirement	ECTS credit
BMEEODHAG42	Technical Internship			Signature	0
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	BIM	English			

Subject code	Subject name			Requirement	ECTS credit
BMEEODHAI41	Infrastructural Design Project			Mid-semester mark	6
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	EN1	English	TUE:10:15-12:00(K376); TUE:10:15-12:00(K376)		

Subject code	Subject name			Requirement	ECTS credit
BMEEODHAI42	Technical practice			Signature	0
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	BIM	English			

Subject code	Subject name			Requirement	ECTS credit
BMEEODHA-PS	Bachelor Thesis Project			Mid-semester mark	15
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	ENA	English			

Subject code	Subject name			Requirement	ECTS credit
BMEEODHA-PT	Preparatory Course for Bachelor Thesis Project			Mid-semester mark	9
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	ENA	English			

Subject code	Subject name			Requirement	ECTS credit
BMEEODHAS41	Design of Structures Projectwork			Mid-semester mark	6
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	EN1	English	TUE:10:15-12:00(EL111); TUE:10:15-12:00(EL111)		

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

Subject code	Subject name			Requirement	ECTS credit
BMEEODHAS42	Industrial Practice			Signature	0
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	ENH	English			
Practice	BIM	English			

20 days of industrial practive at a civil engineering construction company.

Subject code	Subject name			Requirement	ECTS credit
BMEEODHMB5K	Complex Construction IT project			Mid-semester mark	6
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	EN1	English	FRI:12:15-14:00(K144); FRI:12:15-14:00(K144)		

Subject code	Subject name			Requirement	ECTS credit
BMEEODHMG-D	Diploma Project Structural Engineering MSc Program			Mid-semester mark	20
Course type	**Course code**	**Course language**	**Timetable information**		
Practice	ENG	English			

Subject code	Subject name	Requirement	ECTS credit
BMEEODHMN-D	Diploma Project Structural Engineering MSc Program	Mid-semester mark	20

Course type	Course code	Course language	Timetable information
Practice	ENN	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEODHMT-D	Diploma Project Structural Engineering MSc Program	Mid-semester mark	20

Course type	Course code	Course language	Timetable information
Practice	ENT	English	

Subject code	Subject name	Requirement	ECTS credit
BMEEOEMAS42	Building Construction I.	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:10:15-12:00(K183)
Practice	EN1	English	MON:08:15-10:00(K371); MON:08:15-10:00(K371)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOEMAS43	Building Construction II.	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:10:15-12:00(K183)
Practice	EN1	English	MON:14:15-16:00(EOEM_TSZ); MON:14:15-16:00(EOEM_TSZ)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOEMAT42	Civil Engineering Representation and Drawing	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:12:15-14:00(K375); TUE:12:15-14:00(K375)
Practice	EN1	English	TUE:16:15-18:00(K375); TUE:16:15-18:00(K375)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOEMAT43	Construction Materials I.	Exam	5

Course type	Course code	Course language	Timetable information
Laboratory	EN4	English	THU:08:15-10:00(MMFP); THU:08:15-10:00(MMFP)
Laboratory	EN2	English	THU:08:15-10:00(MMFL3); THU:08:15-10:00(MMFL3)
Laboratory	EN1	English	THU:08:15-10:00(MMFL2); THU:08:15-10:00(MMFL2)
Laboratory	EN3	English	THU:08:15-10:00(MMFL4); THU:08:15-10:00(MMFL4)
Lecture	EN0	English	WED:10:15-12:00(K144); WED:10:15-12:00(K144)

Basic physical and hydrotechnical characteristics of the most important structural materials: stress, strength,

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOEMAT44	Building Construction Study	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	FRI:10:15-12:00(K374)
Practice	EN1	English	WED:14:15-16:00(K183); WED:14:15-16:00(K183)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOEMK601	Building Materials 2.	Exam	3

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	THU:14:15-16:00(MMFL2); THU:14:15-16:00(MMFL2)
Lecture	EN0	English	WED:08:15-10:00(EOEM_TSZ); WED:08:15-10:00(EOEM_TSZ)

Subject code	Subject name	Requirement	ECTS credit
BMEEOFTAT41	CAD for Civil Engineers	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	MON:12:15-14:00(K142a); MON:12:15-14:00(K142a)
Laboratory	EN2	English	WED:12:15-14:00(K142a); WED:12:15-14:00(K142a)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOFTAT42	Civil Engineering Informatics	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Laboratory	EN4	English	TUE:08:15-10:00(K142b); TUE:08:15-10:00(K142b)
Laboratory	EN1	English	MON:14:15-16:00(K142a); MON:14:15-16:00(K142a)
Laboratory	EN3	English	FRI:12:15-14:00(K142a); FRI:12:15-14:00(K142a)
Laboratory	EN2	English	WED:14:15-16:00(K142a); WED:14:15-16:00(K142a)
Lecture	EN0	English	THU:12:15-14:00(KM79); THU:12:15-14:00(KM79)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOFTMB52	BIM Modelling and Design	Exam	5

Course type	Course code	Course language	Timetable information
Laboratory	EN2	English	WED:12:15-16:00(K142b); WED:12:15-16:00(K142b)

Subject code	Subject name		Requirement	ECTS credit
BMEEOFTMF-2	Applied geoinformatics		Mid-semester mark	5
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	TUE:12:15-13:00(K142b); TUE:12:15-13:00(K142b)	
Practice	EN1	English	TUE:13:15-15:00(K142b); TUE:13:15-15:00(K142b)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOFTMF-3	Mapping technologies		Exam	5
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	TUE:15:15-16:00(K142b); TUE:15:15-16:00(K142b)	
Practice	EN1	English	TUE:16:15-18:00(K142b); TUE:16:15-18:00(K142b)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOFTMF61	Intelligent Transport Systems		Mid-semester mark	3
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	TUE:08:15-09:00(KF27a); TUE:08:15-09:00(KF27a)	
Practice	EN1	English	TUE:09:15-10:00(KF27a); TUE:09:15-10:00(KF27a)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOFTMF62	ITS GIS		Mid-semester mark	2
Course type	**Course code**	**Course language**	**Timetable information**	
Practice	EN1	English	TUE:10:15-12:00(K372); TUE:10:15-12:00(K372)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOFTMI51	Database systems		Mid-semester mark	3
Course type	**Course code**	**Course language**	**Timetable information**	
Practice	EN1	English	WED:08:15-10:00(K142b); WED:08:15-10:00(K142b)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOFTMK51	Numerical Methods		Mid-semester mark	4
Course type	**Course code**	**Course language**	**Timetable information**	
Practice	EN1	English	THU:08:15-10:00(K142a); THU:08:15-10:00(K142a); FRI:10:15-12:00(K142b)	
Practice	EN2	English	WED:10:15-12:00(KF27c); WED:10:15-12:00(KF27c); FRI:12:15-14:00(KF27c)	
Practice	EN3	English	THU:08:15-10:00(KF27c); THU:08:15-10:00(KF27c); FRI:10:15-12:00(KF27c)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOFTMX61	European Engineering Projectwork		Mid-semester mark	5
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	FRI:14:15-16:00(KM30); FRI:14:15-16:00(KM30)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOGMAS41	Rock Mechanics		Mid-semester mark	3
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	EN3	English	TUE:14:15-16:00(K136)	
Laboratory	EN1	English	TUE:14:15-16:00(KM21)	
Laboratory	EN2	English	THU:14:15-16:00(K136)	
Lecture	EN0	English	TUE:14:15-16:00(KM21)	

Petrophysical properties of solid rocks, the characterisation of rock blocks and rock masses, the jointing system in the rock environment. The deformation processes and rheological characters in rock mechanics, the influence of

joint spacing. The durability and effect of rock environment on the engineering structures. The evaluation of geological conditions in rock environment at tunnels foundations and rocky slopes. The influence of material properties on the petrophysical properties of rocks.

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMAS42	Underground Structures, Deep Found.	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	FRI:08:15-10:00(KM21); FRI:08:15-10:00(KM21)
Practice	EN1	English	FRI:10:15-12:00(KM21)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMAT42	Soil Mechanics	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:12:15-14:00(K372); WED:12:15-14:00(K372)
Practice	EN1	English	FRI:08:15-10:00(K374); FRI:08:15-10:00(K374)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMAT43	Earthworks	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:12:15-14:00(KM21); WED:12:15-14:00(KM21)
Practice	EN2	English	WED:14:15-16:00(K374)
Practice	EN1	English	WED:14:15-16:00(K374)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMAT45	Foundation Engineering	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:10:15-12:00(K375); WED:10:15-12:00(K375); WED:12:15-13:00(K375); WED:12:15-13:00(K375)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMG-1	Engineering Geology MSc	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:08:15-10:00(K136); MON:08:15-10:00(K136)
Practice	EN1	English	MON:10:15-11:00(K136); MON:10:15-11:00(K136)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMG-3	Geotechnical design	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:14:15-16:00(KM21); THU:14:15-16:00(KM21)
Practice	EN1	English	THU:16:15-17:00(KM21); THU:16:15-17:00(KM21)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMG-4	Earthworks of Infrastructures	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:11:15-13:00(EL111); MON:11:15-13:00(EL111)

Practice	EN1	English	MON:13:15-14:00(EL111); MON:13:15-14:00(EL111)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMG61	Tunneling	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:14:15-16:00(KM78); MON:14:15-16:00(KM78)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMG62	Hidrogeology	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:08:15-10:00(K136); WED:08:15-10:00(K136)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMG64	Engineering Geology of Hungary	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:12:15-14:00(K136); TUE:12:15-14:00(K136)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMS51	Geodynamics	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:12:15-14:00(KF27a); WED:12:15-14:00(KF27a)

Subject code	Subject name	Requirement	ECTS credit
BMEEOGMMS5P	Engineering geological and geotechnical project	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Practice	EN1	English	THU:12:15-14:00(KM21); THU:12:15-14:00(KM21)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSA-A1	Steel Buildings	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:12:15-14:00(K370); TUE:12:15-14:00(K370); THU:10:15-12:00(EL111)
Practice	EN1	English	THU:10:15-12:00(EL111)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSA-A2	Reinforced Concrete Buildings	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:08:15-10:00(EL111); TUE:08:15-10:00(EL111); THU:08:15-10:00(EL111)
Practice	EN1	English	THU:08:15-10:00(EL111)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSA-B2	Reinforced Concrete Bridges	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	FRI:12:15-14:00(KF12); FRI:12:15-14:00(KF12)
Practice	EN1	English	FRI:14:15-15:00(KF12); FRI:14:15-15:00(KF12)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSA-B3	Engineering Works	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:14:15-16:00(K375); WED:14:15-16:00(K375)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSA-PP	Structural Design Projectwork	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1	English	TUE:10:15-12:00(KF12); TUE:10:15-12:00(KF12)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSAS43	Bridges and Infrastructures	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:10:15-12:00(KF12); MON:10:15-12:00(KF12)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSAS44	Timber Structures	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:12:15-14:00(KF12); THU:12:15-14:00(KF12)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSAS45	3D Constructional Modelling of Structures	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	WED:10:15-12:00(KF12); WED:10:15-12:00(KF12)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSAS47	Steel and Composite Structures	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:12:15-14:00(KF12); MON:12:15-14:00(KF12); MON:14:15-15:00(KF12); MON:14:15-15:00(KF12)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSAT42	Steel Structures	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:12:15-14:00(K389); THU:10:15-12:00(KF88); THU:10:15-12:00(KF88)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSAT43	Reinforced Concrete Structures	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:08:15-10:00(K375); WED:08:15-10:00(K375); WED:08:15-10:00(K375)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMB51	Civil Engineering Automation, Modelling	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:08:15-10:00(K144)
Practice	EN1	English	THU:10:15-12:00(K144); THU:10:15-12:00(K144)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMI51	Bridges and Infrastructures	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:14:15-16:00(KM26Olt); THU:14:15-16:00(KM26Olt)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMK51	Methods of Engineering Analysis	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	FRI:08:15-09:00(KF12); FRI:08:15-09:00(KF12)
Practice	EN1	English	FRI:09:15-10:00(KF12); FRI:09:15-10:00(KF12)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMS5P	Structures project	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Practice	EN1	English	WED:10:15-12:00(K389); WED:10:15-12:00(K389)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMT-1	Structures 2	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:08:15-10:00(KF88); MON:08:15-10:00(KF88)
Practice	EN1	English	MON:10:15-11:00(KF88); MON:10:15-11:00(KF88)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMT-2	Stability of Structures	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:12:15-14:00(K389); THU:12:15-14:00(K389)
Practice	EN1	English	THU:14:15-15:00(K389); THU:14:15-15:00(K389)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMT-3	Seismic Design	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:08:15-10:00(K389); TUE:08:15-10:00(K389)
Practice	EN1	English	TUE:10:15-11:00(K389); TUE:10:15-11:00(K389)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMT61	Applied Fracture Mechanics	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:14:15-16:00(K389); MON:14:15-16:00(K389)
Practice	EN1	English	MON:16:15-17:00(K389); MON:16:15-17:00(K389)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMT62	Prestressing Technologies	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	FRI:10:15-11:00(KF12); FRI:10:15-11:00(KF12)
Practice	EN1	English	FRI:11:15-12:00(KF12); FRI:11:15-12:00(KF12)

Subject code	Subject name	Requirement	ECTS credit
BMEEOHSMT63	Strengthening of Structures	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:08:15-09:00(EL111); WED:08:15-09:00(EL111)
Practice	EN1	English	WED:09:15-10:00(EL111); WED:09:15-10:00(EL111)

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMAS41	Strength of Materials	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:14:15-16:00(KF88); THU:14:15-16:00(KF88)

Differential equation of the elastic curve, computation of the deflected shape for various boundary conditions. Virtual displacement systems, virtual work. Theorem of virtual displacements. Computation of external and internal forces of statically determinate structures using the theorem of virtual displacements. Concept of potential energy, theorem of stationarity of potential energy, application of the theorem for the computation of displacements of structures. Concept of complementary potential, theorem of minimum complementary potential energy, using the theorem for the computation of reactions of structures. Revision of common work and energy theorems of mechanics. Characterization of equilibrium states, concept of critical load. Methods of stability analysis: statical, kinematical, and energy methods. Elastic Euler buckling.

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMAT41	Basics of Statics and Dynamics	Exam	6

Course type	Course code	Course language	Timetable information
Practice	EN1	English	MON:10:15-12:00(K389); MON:10:15-12:00(K389); TUE:12:15-14:00(KM78); TUE:12:15-14:00(KM78); FRI:12:15-14:00...

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMAT42	Introduction to Strength of Materials	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Practice	EN1	English	MON:12:15-14:00(K373); MON:12:15-14:00(K373); WED:12:15-14:00(KM78); FRI:14:15-16:00(K373); FRI:14:15-16:...

Practice	EN2	English	MON:12:15-14:00(KM78); MON:12:15-14:00(KM78); WED:12:15-14:00(KM78); FRI:14:15-16:00(KM78); FRI:14:15-16:...

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMAT43	Structural Analysis I.	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:12:15-14:00(K389); TUE:12:15-14:00(K389); THU:16:15-18:00(K372); THU:16:15-18:00(K372)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMMN-1	Structural Dynamics	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:11:15-13:00(KF88); MON:11:15-13:00(KF88)
Practice	EN1	English	MON:13:15-14:00(KF88); MON:13:15-14:00(KF88)

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMMN61	Plasticity	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:15:15-16:00(KM78); THU:15:15-16:00(KM78)
Practice	EN1	English	THU:16:15-17:00(KM78); THU:16:15-17:00(KM78)

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMMN62	Nonlinear FEM	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:11:15-13:00(K144); TUE:11:15-13:00(K144)

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMMN63	Analysis of Rods and Frames	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:10:15-11:00(KM78); THU:10:15-11:00(KM78)
Practice	EN1	English	THU:11:15-12:00(KM78); THU:11:15-12:00(KM78)

Subject code	Subject name	Requirement	ECTS credit
BMEEOTMMS5P	Numerical modeling project	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Practice	EN1	English	THU:08:15-10:00(KM78); THU:08:15-10:00(KM78)

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVAI42	Transportation Networks	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:12:15-14:00(K372); TUE:12:15-14:00(K372)

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVAI44	Highway and Railway Laboratory Course	Mid-semester mark	1

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	FRI:09:15-12:00(EL111,ELUVlab); FRI:09:15-12:00 (EL111,ELUVlab)

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVAI45	Infrastructural CAD Course	Mid-semester mark	1

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	TUE:14:15-16:00(KM78); TUE:14:15-16:00(KM78)
Laboratory	EN2	English	TUE:16:15-18:00(KF99); TUE:16:15-18:00(KF99)

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVAT41	Railway Tracks	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:14:15-17:00(K373); MON:14:15-17:00(K373)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVAT42	Roads	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:14:15-16:00(KM79); MON:14:15-16:00(KM79)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVMU-2	Design of Railway Stations	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:08:15-10:00(KF99); MON:08:15-10:00(KF99)
Practice	EN1	English	MON:10:15-11:00(KF99); MON:10:15-11:00(KF99)

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVMU-3	Pavement Management Systems	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:12:15-14:00(K376); TUE:12:15-14:00(K376)

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVMU63	Pavement Structures	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:10:15-12:00(KF99); THU:10:15-12:00(KF99); FRI:08:15-10:00(KF99); FRI:08:15-10:00(KF99)

Subject code	Subject name	Requirement	ECTS credit
BMEEOUVMU65	Economics of Civil Engineering Projects	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:10:15-12:00(KM78); TUE:10:15-12:00(KM78)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVKA-H1	Drinking Water and Wastewater Treatment	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:12:15-15:00(K370); MON:12:15-15:00(K370)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVKAI43	Water Chemistry and Hydrobiology	Exam	3

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	FRI:14:15-18:00(EOVK_TSZ); FRI:14:15-18:00(EOVK_TSZ)
Lecture	EN0	English	THU:14:15-16:00(KM31); THU:14:15-16:00(KM31)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVKAI45	Legal Aspects of Water and Environment	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:12:15-14:00(KM31); THU:12:15-14:00(KM31)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVKAT41	Basics of Environmental Engineering	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:14:15-16:00(KM30); TUE:14:15-16:00(KM30)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOVKAT42	Public Works I.	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	WED:16:15-18:00(KF10); WED:16:15-18:00(KF10)
Practice	EN1	English	WED:14:15-16:00(KF10)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOVKMI53	Dewatering	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:12:15-14:00(KM26Olt); MON:12:15-14:00(KM26Olt)

Subject code	Subject name		Requirement	ECTS credit
BMEEOVKMV61	Water and wastewater treatment plants		Mid-semester mark	3
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	TUE:11:15-13:00(EOVK_TSZ); TUE:11:15-13:00(EOVK_TSZ)	
Practice	EN1	English	TUE:13:15-14:00(EOVK_TSZ); TUE:13:15-14:00(EOVK_TSZ)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOVKMV62	Water quality management		Mid-semester mark	2
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	MON:10:15-11:00(KM78); MON:10:15-11:00(KM78)	
Practice	EN1	English	MON:11:15-12:00(KM78); MON:11:15-12:00(KM78)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOVKMV63	Public water utility systems modelling		Mid-semester mark	4
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	TUE:08:15-10:00(KM31); TUE:08:15-10:00(KM31)	
Practice	EN1	English	TUE:10:15-11:00(KM31); TUE:10:15-11:00(KM31)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOVVA-F1	Water Utilisation, Mater Damage Prevention		Exam	5
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	TUE:14:15-16:00(K376); TUE:14:15-16:00(K376); FRI:12:15-14:00(K375); FRI:12:15-14:00(K375)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOVVAI42	Hydraulics 2		Exam	3
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	FRI:10:15-12:00(KF88); FRI:10:15-12:00(KF88)	
Practice	EN1	English	FRI:12:15-13:00(KF88); FRI:12:15-13:00(KF88)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOVVAI43	Water Resources Management		Exam	3
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	TUE:08:15-10:00(K372); TUE:08:15-10:00(K372)	

Subject code	Subject name		Requirement	ECTS credit
BMEEOVVAI44	Hydrometric field course		Mid-semester mark	2
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	EN1	English		

Subject code	Subject name		Requirement	ECTS credit
BMEEOVVAT41	Hydrology I.		Mid-semester mark	3
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EN0	English	MON:10:15-12:00(KF10)	
Practice	EN1	English	MON:10:15-12:00(KF10)	

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOVVAT42	Hydraulics I.	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:10:15-12:00(KM79); TUE:10:15-12:00(KM79)
Practice	EN1	English	WED:12:15-14:00(K374)
Practice	EN2	English	WED:12:15-14:00(K374)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOVVAT43	Hydraulic Engineering, Water Management	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:08:15-10:00(KF88); THU:08:15-10:00(KF88)
Practice	EN1	English	WED:10:15-12:00(KF10)
Practice	EN2	English	WED:10:15-12:00(KF10)

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

Subject code	Subject name	Requirement	ECTS credit
BMEEOVVMV-2	Hydromophology	Exam	4

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	
Laboratory	EN2	English	
Lecture	EN0	English	THU:12:15-14:00(K371); THU:12:15-14:00(K371)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVVMV61	Design of Water Use Structures	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	FRI:08:15-10:00(KF10); FRI:08:15-10:00(KF10)
Practice	EN1	English	FRI:10:15-11:00(KF10); FRI:10:15-11:00(KF10)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVVMV63	Groundwater	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	MON:08:15-10:00(K372); MON:08:15-10:00(K372)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVVMV64	Hydrography and Hydroinformatics	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:08:15-10:00(K375); THU:08:15-10:00(K375)
Practice	EN1	English	THU:10:15-12:00(K375); THU:10:15-12:00(K375)

Subject code	Subject name	Requirement	ECTS credit
BMEEOVVPRE5	Basic Hydraulics	Mid-semester mark	0

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	THU:08:15-10:00(K376); THU:08:15-10:00(K376)

Basic knowledge on the mechanics of fluids: basic physical quantities and their measurement, standard units of measurements, behaviour of fluids at rest and in motion, fundamental laws of hydrostatics and fluid dynamics /*

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Faculty of Economic and Social Sciences

IMPORTANT NOTES

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Subject code	Subject name	Requirement	ECTS credit
BMEGT301004	Economics I.	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EEN42BM	English	THU:10:15-12:00

Objectives and description of the course: The aim is to allow students to understand todayrsquo;s economic environment. After having finished the course, students should understand the key concepts of microeconomics (e.g. opportunity cost, supply and demand, market equilibrium, prices, cost functions, profit, competition and monopoly), master a basic set of tools of economic analysis and demonstrate the ability to apply them to simple practical problems. This course is primarily designed as an introduction to microeconomic theory for undergraduate students pursuing a bachelorrsquo;s degree in engineering. Both the course and the recommended textbook are accessible to students without a strong math background. Integral calculus is not used and the most important ideas are also demonstrated in graphs.

Subject code	Subject name	Requirement	ECTS credit
BMEGT30A001	Micro- and Macroeconomics	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EEN42BM	English	WED:08:15-10:00(QAF14); WED:08:15-10:00(QAF14); THU:12:15-14:00(QAF14); THU:12:15-14:00(QAF14)

Selected topics and analytical techniques in micro- and macroeconomics tailored for engineering students. Introduction to microeconomics. Some basic economic concepts and analytical tools. Scarcity: source of eternal struggle or the foundation of all economic systems? How does ldquo;choicerdquo; determine everyday life, and what role does it play in the operation of businesses? Opportunity cost, sunk cost, normal profit. How does the product market work? Consumer choice: what are the options on the demand side, what are the goals of the consumer and how they are achieved? The forms and aims of businesses. Basics of accounting and finance. Cost and profit analysis. Competition and market systems. Introduction to macroeconomics. How does government policy interact with the decisions, profitability and life cycle of businesses? The main issues of macroeconomic study: gross domestic product, changes in the price level, unemployment ratio. Governmental policies: tools and effects. Fiscal policy: direct intervention to the life of the households and firms. Monetary policy: changes in the regulations, workings and major indicators of the financial market, and their effect on the households and firms. Economic growth and productivity. Issues of international trade: exchange rate and exchange rate policy.

Subject code	Subject name	Requirement	ECTS credit
BMEGT30MS07	Economic Analysis of Technology	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	EEN28VE	English	TUE:08:15-10:00

Objectives and description of the course: Recently the education in different fields of engineering does not contain only the traditional topics of technology, but also elements from economic sciences. Thus engineers will be engaged to understand economic consequences of their decisions. The aim of the present subject is to give an introduction into this field based on empirical investigations as well as on theoretical approaches. After a short introduction it will be shown how basic categories could be used to describe the situation being under consideration. It follows the detailed investigation of the special relationship between technology and costs, again based on empirics and on traditional models. The next block contains questions dealing with the economic consequences of technological decisions, e. g. exhausting of natural resources, transport problem, environmental decisions, choosing production places, etc. Finally, problems of market structure (free competition, monopoly, monopolistic competition, oligopoly, etc.) caused by technology will be analyzed.

Subject code	Subject name	Requirement	ECTS credit
BMEGT30N002	Industrial Organization	Exam	6

Course type	Course code	Course language	Timetable information
Lecture	EEN22BM	English	

This course is about different theoretical approaches to the organization and institutions of a market economy. The of the course is to get students acquainted with the most recent theories of different market structures and to their

potential applications to practical problems related to market strategy and market regulation. After having finished the course, students should understand the key concepts of monopolistic and oligopolistic markets, the ways companies play their strategic games under different market conditions and the role a government can and should play in correcting market failures. /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Normál táblázat"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-parent:""; mso-padding-alt:0cm 5.4pt 0cm 5.4pt; mso-para-margin:0cm; mso-para-margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:10.0pt; font-family:"Times New Roman",serif;}

Subject code	Subject name	Requirement	ECTS credit
BMEGT42A011	Environmental Economics	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EEN40GT	English	THU:12:15-14:00

Subject code	Subject name	Requirement	ECTS credit
BMEGT42A022	Environmental Evaluation and Risk Management	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	EEN34BM	English	TUE:10:15-12:00

Monetary valuation of natural capital and the concept of sustainable development (weak and strong sustainability). The necessity to valuate natural resources: the problem of public goods and free goods, discounting (social discount rate) and externalities. The areas of application and methodological basics of environmental valuation. The concept and elements of Total Economic Value. A detailed overview of the methods of environmental valuation: cost-based methods, productivity approach, revealed preference methods (hedonic pricing and travel cost method), stated preference or hypothetical methods and benefit transfer. An introduction to risk management: definition and approaches of risk, corporate risk management techniques, corporate social responsibility. Cost-benefit and cost-effectiveness analysis, case studies.

Subject code	Subject name	Requirement	ECTS credit
BMEGT42A410	Environmental Management	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EEN08GE	English	TUE:14:15-16:00(R108); TUE:14:15-18:00(R108)

Subject code	Subject name	Requirement	ECTS credit
BMEGT42M104	Sustainable Environmental and Natural Resource Management	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EEN20GT	English	WED:12:15-16:00

The course unit aims to achieve two main goals. Firstly, to teach students the economic theory governing the efficient allocation of environmental and natural resources, based on their scarcity and renewability. Secondly, to offer an insight into the practical use-related questions of the various types of environmental and natural resources, with an overview of best practices currently available.

Subject code	Subject name	Requirement	ECTS credit
BMEGT42M105	Environmental and Regional Politics of the EU	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Lecture	EEN12GT	English	MON:12:15-16:00

Subject code	Subject name	Requirement	ECTS credit
BMEGT42M111	Sectorial Sustainability Studies	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Lecture	EEN13GT	English	MON:10:15-14:00

Subject code	Subject name	Requirement	ECTS credit
BMEGT42V101	BME International Climate Change Role-Play	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EEN06BM	English	THU:16:15-19:00

Subject code	Subject name	Requirement	ECTS credit
BMEGT52A002	Psychology	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EEN01BM	English	

Human cognition: Sensation: sensory systems, vision, hearing, the chemical senses, somatic senses and the vestibular system. Perception: organising the perceptual world, theories and illusions. Attention, focussed and divided attention. Memory: three stages of memory: sensory, short-term and long-term. Some phenomena of memory: mnemonics, peg word system, interferences. Thinking: human information processing system. Decision making and problem solving. Mental abilities, intelligence and creativity, cognitive styles. Learning, classical and instrumental theory of conditioning. Cognitive processes in learning: insight, latent learning and cognitive maps. Social learning. Motivation: Basic concepts of motivation. Work and motivation: achievement, satisfaction and procrastination. Emotion, emotional intelligence (Goleman). Stress and coping system, some stress-coping programmes. Type A behaviour. Personality: Studying personality (tests), psychodynamic (Freud, Jung), behavioural, and phenomenological (Rogers, Maslow) approaches. The individual in the social world: Some basic sources of social influence, social perception, first impressions, group stereotypes and prejudice, attribution theory. Attitudes and persuasion. Group influences and interpersonal behaviour. Communication: assertiveness, social skills in communication.

Subject code	Subject name	Requirement	ECTS credit
BMEGT52A012	Training for the development of leadership skills	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	GEN01GT	English	

Subject code	Subject name	Requirement	ECTS credit
BMEGT52V100	Fashion and the Psychology of Advertising	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EEN01BM	English	

The course aims to have a look behind the scenes of the colorful and glamorous world of fashion and advertising. What we see at first glance is a huge industry where millions of professionals are pushing the maschinery to play upon our instincts. We shall study the methods, reviewing the role of public relations, sales promotion, the role of the brands, and the templates and stereotypes used in the different media. The vast amount of knowledge piled up by behavioral sciences will help us answer the question why our basic instincts to imitate can be used and abused. Why is it that we are ready to spend billions on shampoo, new clothes, junk food, gadgets ... etc. hoping to buy identity. We will also reveal that the very nature of the social animal - the group - plays an even more decisive role in our preferences and purchases – introducing a variety of approaches from the basic theories of fashion (trickle down, cascade, herd behavior) to network theories. /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Normál táblázat"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-parent:""; mso-padding-alt:0cm 5.4pt 0cm 5.4pt; mso-para-margin:0cm; mso-para-margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:10.0pt; font-family:"Times New Roman",serif;}

Subject code	Subject name	Requirement	ECTS credit
BMEGT55A001	Business Law	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EEN15ER	English	

The aim of the course: Characteristics of the Anglo-Saxon and continental systems of business law. The development of the system of the Hungarian business law. Basic legal institutions of the state to manage the economics. Organisations and enterprises as the subjects of law: conceptional questions. International models of company law. The development of the Hungarian company law. General rules of the Hungarian Company Act. Internal organisation of companies. The law of company registration, the registration proceedings and the company registry. Companies with a partnership profile. Companies limited by shares. Concept and types of securities. Competition law. EU directives and regulations on companies and competition: their execution in the Hungarian law.

Subject code	Subject name	Requirement	ECTS credit
BMEGT55MN02	Economic Law of the EU	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EEN08ER	English	

Faculty of Electrical Engineering and Informatics

IMPORTANT NOTES

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Subject code	Subject name	Requirement	ECTS credit
BMEVIAUAB00	Software Techniques	Exam	5

Course type	Course code	Course language	Timetable information
Laboratory	ALE	English	THU:10:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VIAUAB00/en/

Subject code	Subject name	Requirement	ECTS credit
BMEVIEEAB00	Microelectronics	Exam	5

Course type	Course code	Course language	Timetable information
Laboratory	al1e	English	FRI:08:15-10:00
Lecture	aee	English	MON:14:15-16:00

https://portal.vik.bme.hu/kepzes/targyak/VIEEAB00/en/ The basic goal of the course is to deepen the already acquired knowledge in the field of digital electronics through presenting the latest implementation techniques of digital integrated circuits. Further goals of the subject are to provide information on the basics of analogue integrated circuits, components of power electronics and solid-state lightning. Today’s electronics and IT devices are all based on different special discrete semiconductors and complex integrated circuits. Solid knowledge regarding the structure, operation and manufacturing of these devices is among the necessary skills of today’s electrical engineers including basics of IC design at least on the level which allows effective communication with IC design specialists. They have to know how system level design connects with the IC design as well. Special emphasis is put on the corresponding practical skills through simple case studies (calculation examples) as well as computer laboratory practices where the students get acquainted with the basic steps IC design. An important aspect of the course is to bridge the gap between the operation of abstract electronics components and the physical reality: the major components used in ICs (diodes, transistors, etc.) are discussed in detail. A detour is made towards the MEMS and MOEMS, where electrical operation is combined with mechanical and optical effects.

Subject code	Subject name	Requirement	ECTS credit
BMEVIHIAA03	Computer Architectures	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EA	English	WED:08:15-10:00; WED:08:15-10:00; THU:10:15-12:00
Practice	EG	English	THU:10:15-12:00

Subject code	Subject name	Requirement	ECTS credit
BMEVIHIAB03	Electronics 1	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	E_ERASMUS	English	WED:10:15-12:00
Practice	G_ERASMUS	English	THU:10:15-12:00

Subject code	Subject name	Requirement	ECTS credit
BMEVIHIAC01	IT Security	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	EA	English	WED:09:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VIHIAC01/en/ This course gives an overview of the different areas of IT security with the aim of increasing the security awareness of computer science students and shaping their attitude towards designing and using computing systems. The course prepares BSc students for security challenges that they may encounter during their professional carrier, and at the same time, it provides a basis for those student who want to comtinue their studies at MSc level. We put special emphasis on software security and the practical aspects of developing secure programs.

Subject code	Subject name	Requirement	ECTS credit
BMEVIHIAV35	Privacy-Preserving Technologies	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	EA	English	WED:12:15-14:00

https://portal.vik.bme.hu/kepzes/targyak/VIHIAV35/en/ This course provides an introduction into the practical problems of data protection and privacy. Students can develop skills of understanding and assessing privacy threats and designing countermeasures. The course focuses on the problem of unwanted personal and sensitive data leakage from different information sources (e.g., large datasets, web-tracking, encrypted traffic, source/binary code, machine learning models), and its detection as well as mitigations using Privacy Enhancing Technologies (PETS). The objective of the course is to provide skills needed by Data Protection Officers (DPO) and also required by the European General Data Protection Regulation (GDPR).

Subject code	Subject name	Requirement	ECTS credit
BMEVIHIAV37	V2X Communication Technologies of Autonomous Vehicles	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EA	English	TUE:12:15-14:00
Practice	GA	English	THU:12:15-14:00

Subject code	Subject name	Requirement	ECTS credit
BMEVIHIAV39	Administrating Computer Networks in Practice I.	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Laboratory	LA2	English	WED:16:15-18:00(IL107)

https://portal.vik.bme.hu/kepzes/targyak/VIHIAV39/en/ The basic objective of "Administrating Computer Networks I." is to introduce the practical administration of computer networks - including network design, installation, and configuration of network devices. This subject gives the basics of "Administration Computer Networks in Practice II." (VIHIAV42) subject, thus providing adequate theoretical and practical knowledge and the way of its direct application. The students who successfully complete also the subject "Administrating Computer Networks II" acquire the knowledge and skills required for the Cisco CCNA (Cisco Certified Network Associate) certification. The certification can be obtained in authorized examination centers, independently from the University education.

Subject code	Subject name	Requirement	ECTS credit
BMEVIHIMA07	Mobile and Wireless Networks	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EA	English	
Practice	GA	English	

https://portal.vik.bme.hu/kepzes/targyak/VIHIMA07/en/ The objective of this course is to introduce today’s modern wireless and mobile systems to our students. This contains basic knowledge needed to operate and maintain such networks. Further goal of this course is to show the possibilities and operations of advanced radio and wireless solutions, through practical examples.amp;lt;!-- --amp;gt; amp;lt;!-- /* Font Definitions */ @font-face {font-family:"MS Mincho"; panose-1:2 2 6 9 4 2 5 8 3 4; mso-font-alt:"MS ??"; mso-font-charset:128; mso-generic-font-family:modern; mso-font-pitch:fixed; mso-font-signature:-536870145 1791491579 18 0 131231 0;} @font-face {font-family:"MS Mincho"; panose-1:2 2 6 9 4 2 5 8 3 4; mso-font-alt:"MS ??"; mso-font-charset:128; mso-generic-font-family:modern; mso-font-pitch:fixed; mso-font-signature:-536870145 1791491579 18 0 131231 0;} @font-face {font-family:Cambria; panose-1:2 4 5 3 5 4 6 3 2 4; mso-font-charset:0; mso-generic-font-family:roman; mso-font-pitch:variable; mso-font-signature:-536870145 1073743103 0 0 415 0;} @font-face {font-family:"\@MS Mincho"; panose-1:2 2 6 9 4 2 5 8 3 4; mso-font-charset:128; mso-generic-font-family:modern; mso-font-pitch:fixed; mso-font-signature:-536870145 1791491579 18 0 131231 0;} /* Style Definitions */ p.MsoNormal, li.MsoNormal, div.MsoNormal {mso-style-unhide:no; mso-style-qformat:yes; mso-style-parent:""; margin:0cm; margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:12.0pt; font-family:"Cambria","serif"; mso-ascii-font-family:Cambria; mso-ascii-theme-font:minor-latin; mso-fareast-font-family:"MS Mincho"; mso-fareast-theme-font:minor-fareast; mso-hansi-font-family:Cambria; mso-hansi-theme-font:minor-latin; mso-bidi-font-family:"Times New Roman"; mso-bidi-theme-font:minor-bidi; mso-ansi-language:EN-US; mso-fareast-language:EN-US;} p.MsoCommentText, li.MsoCommentText, div.MsoCommentText {mso-style-noshow:yes; mso-style-priority:99; mso-style-link:"Jegyzetszöveg Char"; margin:0cm; margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:12.0pt; font-family:"Cambria","serif"; mso-ascii-font-family:Cambria; mso-ascii-theme-font:minor-latin; mso-fareast-font-family:"MS Mincho"; mso-fareast-theme-font:minor-fareast; mso-hansi-font-family:Cambria; mso-hansi-theme-font:minor-latin; mso-bidi-font-family:"Times New Roman"; mso-bidi-theme-font:minor-bidi; mso-ansi-language:EN-US; mso-fareast-language:EN-US;} span.MsoCommentReference {mso-style-noshow:yes; mso-style-priority:99; mso-ansi-font-

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Subject code	Subject name	Requirement	ECTS credit
BMEVIHIMA24	Quantum Computers and their Applications	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	EA	English	WED:08:15-10:00
Practice	GA	English	THU:14:15-16:00

Subject code	Subject name	Requirement	ECTS credit
BMEVIHVAA03	Signals and Systems 1	Exam	6

Course type	Course code	Course language	Timetable information
Lecture	EA	English	MON:14:15-16:00; MON:14:15-16:00; TUE:10:15-12:00
Practice	GA	English	TUE:10:15-12:00; THU:12:15-14:00; THU:12:15-14:00

Subject code	Subject name	Requirement	ECTS credit
BMEVIHVMA01	Broadband Wireless Telecommunication and Broadcasting Systems	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EA	English	
Practice	GA	English	

https://portal.vik.bme.hu/kepzes/targyak/VIHVMA01/en/

Subject code	Subject name	Requirement	ECTS credit
BMEVIHVMA07	Communication Theory	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	EA	English	

https://portal.vik.bme.hu/kepzes/targyak/VIHVMA07/en/

Subject code	Subject name	Requirement	ECTS credit
BMEVIIIAB10	Control Engineering	Exam	5

Course type	Course code	Course language	Timetable information
Laboratory	AL	English	WED:14:15-16:00
Lecture	AE	English	THU:08:15-10:00
Practice	AG	English	WED:14:15-16:00

Subject code	Subject name	Requirement	ECTS credit
BMEVIIIMA21	Robot Manipulators and Mobile Robots	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	AE	English	WED:08:15-10:00
Practice	AG	English	THU:14:15-16:00

Subject code	Subject name		Requirement	ECTS credit
BMEVIMIAB02	Measurement Technology		Exam	6
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	LA	English	FRI:10:15-12:00	
Lecture	EA	English	TUE:14:15-17:00	
Practice	GA	English	THU:14:15-16:00	

Subject code	Subject name		Requirement	ECTS credit
BMEVIMIAV07	ARM Cortex Core Microcontrollers		Exam	4
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	LA	English	THU:13:15-14:00	
Lecture	EA	English	TUE:12:15-14:00	
Practice	GA	English	THU:12:15-13:00	

Subject code	Subject name		Requirement	ECTS credit
BMEVIMIMA23	Measurement Theory		Exam	5
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EA	English	TUE:14:15-17:00	

Subject code	Subject name		Requirement	ECTS credit
BMEVIMIMA26	Formal Methods		Mid-semester mark	5
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	EA	English	MON:14:15-17:00	

Subject code	Subject name		Requirement	ECTS credit
BMEVITMAB05	Infocommunications		Exam	6
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	AE1	English	WED:12:15-14:00; WED:12:15-14:00; THU:12:15-14:00	
Practice	AG1	English	FRI:12:15-14:00	

Subject code	Subject name		Requirement	ECTS credit
BMEVITMAB06	Communication Networks		Exam	7
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	ALER	English	MON:14:15-18:00	
Lecture	AER	English	MON:12:15-14:00; WED:08:15-10:00	

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https://portal.vik.bme.hu/kepzes/targyak/VITMAB06/en/

Subject code	Subject name		Requirement	ECTS credit
BMEVITMAC02	Information Systems Management		Mid-semester mark	4
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	AL1	English	WED:14:15-18:00	
Lecture	AE1	English	THU:10:15-12:00	

https://portal.vik.bme.hu/kepzes/targyak/VITMAC02/en/

Subject code	Subject name		Requirement	ECTS credit
BMEVITMMB03	Engineering Management		Exam	4
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	AE1	English	FRI:08:15-12:00	

Engineering management (EM) in the knowledge-based society. Definition, role and areas of the EM. The evolution of the EM discipline. Peculiarities, generic trends and EM of the information, communication and electronic media technologies (ICT). Managerial elements of the engineering activity. Components and principles of the managerial

activity. Managerial situations, methods and tools. Strategic management. Strategy types and parts. Business strategic planning methods. Classes of competitive strategies. Implementation of strategy: success factors, progress tracing. Methods of the strategic direction and control. Complex engineering decision problems, customer-oriented and systemic approaches, solutions, procedures. Planning and allocation of resources, multi-project management. Management of organizations. Organization types in the ICT sector. Lifecycle, decision culture of organizations, change management. Managing cooperation of organizations, complex working groups. Knowledge management. Knowledge process: accumulation, internalization, adaptation, externalization. Competence. Knowledge sharing and transfer. Knowledge based systems. Types of the intellectual property, principles of intellectual property rights. Open access software. Exploitation of the intellectual properties. Intellectual public utilities. ICT specific EM. Technology management. Technological planning, forecast, transfer, launching, change. Making technology vision, analyzing driving forces, scenarios. Technology-driven business strategies. Corporate ICT functions. Application of the ICT in shaping new business strategies, global work-flows, efficient organization structures. Innovation management. Goals of research, development and innovation. Innovation models and metrics. Management of the innovation process, quality and risks. Innovation chain: university-industry partnership, role of the government. Multi-tier organization and operation of the research-development-innovation management. Innovation financing. National and EU sources, grants, funds, tenders. Development projects. Technological incubators, innovation centers, start-up companies, technological consortia in the ICT sector. Product management. Goals and process of the product development. Markets of the ICT products and services. Market players, competitive environment. Market segmentation. Life-cycle of the product, and its management. Product pricing, price-sensitivity of the customers. Market-research, sale and sale-support methods. Business process management. Analyzing, planning, regulating, improving and transforming corporate business process. Criteria of the process-based management systems. Methods for developing processes. IT in the corporate value creation. Customer relationship management (CRM), operation support systems, supply chain management, business continuity management. Special business functions (e.g. billing), industry-specific systems, IT system architecture of telecommunication service providers. Regulatory environment. Sector regulation. Goals and principles of the regulation in general and in the networked and public service sectors. Competition regulation, consumer protection. Regulatory institutions and procedures, ex-ante and ex-post regulation, self-regulation, public hearing, standards. Regulation of the information and communication technologies and markets. Technology and marker regulatory models in the ICT sector. Regulatory tasks for deploying the convergence of the telecommunications, information and media technology sectors. Community and national regulation of the electronic communications network and services. Framework and specific directives. Rules for the cooperation of the network operators and service providers. Regulation for managing scarce resources, frequency, number and address management. Concept for regulating information security, data protection and content.https://portal.vik.bme.hu/kepzes/targyak/VITMMB03/en/

Subject code	Subject name	Requirement	ECTS credit
BMEVIVEMA03	Power System Transients	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	2324_2_VIVEMA03_elm_angol	English	
Practice	2324_2_VIVEMA03_gyak_angol	English	

https://portal.vik.bme.hu/kepzes/targyak/VIVEMA03/en/ Objectives, learning outcomes and obtained knowledge: Understanding physics processes of electromagnetic transients in power systems, being familiar with the origin of transients and their consequences to the operation of electrical energy system. The aim of the course is to help students in understanding transient phenomena appearing at abnormal conditions (e.g. switching on or off, during short-circuit and fault clearing), to be familiar with design practices and protection principles against overvoltages and to get deep understanding about operation of advanced solution methods to reduce the risk of failures. Practical lectures are dedicated to develop simplified equivalent circuits and calculation methods. Students will have an opportunity to learn how to operate modern power system transient simulation software tools and how to create digital models and evaluate results obtained by computer simulation Synopsis: a) The role of electromagnetic transients in the operation and reliability of the electric power systems. b) Electromagnetic wave propagation - Ideal single phase – earth return system: Laws governing wave propagation in an ideal single-phase-ground return system. Characteristics and calculation methods of transients resulting from multiple reflexion of electromagnetic waves. - Exercise: Characteristics of electrical circuits composed by lumped and distributed parameter elements, transients on transmission lines caused by line energization, de-energization and reclosing, protection measures against over-stresses, discharging lines and cables, transients caused by short distance fault current interruption. c) Reference circuits for transient studies: - The purpose and construction rules of reference-circuits. - Reference circuits of electrical systems of mixed structure with lumped inductance and capacitance. - Exercise: Ferranti effect, steady state voltage rise at the end of long EHV lines, switching transients when energising long OHLs. Protecting substation equipment against lightning overvoltages, influence of long and short cable sections at SS entrance d) Wave propagation on multiphase systems, identification of modular waves. Line energization and reclosing transients on multiphase systems. Reclosing with and w/o faults on EHV lines. Interrupting line charging currents, influence of trapped charge on switching transients. Exercise: Simulation of switching transients on multiphase lines by using ATP-EMTP software. Line energization with closing resistor. Point-on-wave reclosing, polarity

reclosing e) Influence of losses: conductor and earth return losses, corona loss f) Modelling winding structure of transformer, shunt reactor and rotating machines for transient studies. g) Numerical methods and sw tools suitable for studying electromagnetic transients

Faculty of Mechanical Engineering

IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully.Civil Engineering courses are on the website seperately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTBG11	Fluid Mechanics	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Laboratory	A-2024t-L1	English	TUE:10:15-12:00(AE_NAGYLAB)
Lecture	A-2024t-E	English	MON:10:15-12:00(KF87)
Practice	A-2024t-G1	English	TUE:08:15-10:00(KF82)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGE%C3%81TBG11#160;http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATBG11https://gpk.bme.hu/en/content/42#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTBG15	Technical Acoustics and Noise Control	Exam	3

Course type	Course code	Course language	Timetable information
Laboratory	A-2024t-L-prs	English	TUE:16:15-18:00(AE_NAGYLAB)
Lecture	A-2024t-E	English	THU:14:15-16:00(KF87)

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Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTBG36	Computational Fluid Dynamics	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	A-2024t-L2	English	TUE:10:15-12:00(AE_CFDLAB)
Laboratory	A-2024t-L3	English	TUE:12:15-14:00(AE_CFDLAB)
Laboratory	A-2024t-L1	English	TUE:08:15-10:00(AE_CFDLAB)
Lecture	A-2024t-E	English	MON:10:15-12:00(KF81,KF83)

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Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTBKSD	Final Project	Mid-semester mark	15

Course type	Course code	Course language	Timetable information
Practice	A-2024t-G	English	

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Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTBKSZ	Summer Internship	Signature	0

Course type	Course code	Course language	Timetable information
Practice	A-2024t-G	English	

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Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNKDA	Master Thesis Project A	Mid-semester mark	15

Course type	Course code	Course language	Timetable information
Practice	A-2024t-G	English	

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGE%C3%81TNKDA#160;http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNKDAhttps://gpk.bme.hu/en/content/42#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNKDB	Master Thesis Project B	Mid-semester mark	15

Course type	Course code	Course language	Timetable information
Practice	A-2024t-G	English	

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGE%C3%81TNKDB#160;http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNKDBhttps://gpk.bme.hu/en/content/42#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNKPR	Teamwork Project	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Laboratory	A-2024t-L	English	

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGE%C3%81TNKPR#160;http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNKPRhttps://gpk.bme.hu/en/content/42#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNKSG	Internship M	Signature	0

Course type	Course code	Course language	Timetable information
Practice	A-2024t-G	English	

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Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNW01	Advanced Fluid Mechanics	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	A-2024t-E	English	WED:12:15-15:00(KF87)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGE%C3%81TNW01#160;http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNW01https://gpk.bme.hu/en/content/42#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNW03	Fluid Mechanics Measurements	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Laboratory	A-2024t-L	English	TUE:14:15-16:00(AE_NAGYLAB)
Lecture	A-2024t-E	English	MON:12:15-14:00(KF87)

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Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNW21	Open Source Computational Fluid Dynamics	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	A-2024t-L1	English	WED:09:15-11:00(AE_CFDLAB)
Laboratory	A-2024t-L2	English	WED:12:15-14:00(AE_CFDLAB)
Lecture	A-2024t-E	English	MON:12:15-14:00(AE_MERLEG-T)

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Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTNW22	Aero-Elasticity	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	A-2024t-E	English	WED:16:15-18:00(AE_MERLEG-T)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGE%C3%81TNW22#160;http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNW22https://gpk.bme.hu/en/content/42#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEÁTOF01	Individual Project	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	A-2024t-L-szabval	English	

Subject code	Subject name	Requirement	ECTS credit
BMEGEÉEBG61	Processes and Equipment of Chemical Industry	Exam	7

Course type	Course code	Course language	Timetable information
Laboratory	A7	English	THU:09:15-12:00
Lecture	A5	English	MON:12:15-15:00(D102)
Practice	A6	English	THU:12:15-14:00(D102)

Aim of the subject: Theory and practice of mechanical, hydromechanical, thermal, and diffusion processes often used in chemical, food industry, biotechnology and environmental protection. Equipment, sizing and operation aspects. Topics of the subject: 1. Size reduction, milling. Liquid mixing. Types of impellers, baffles. Power number function. Example. Non-Newtonian liquids and their mixing. Settling in gravitation. Suspension types, measurement of settling velocity. Example. 2. Settling in centrifuges, Construction and operation of cyclones. Separation efficiencies. 3. Surface filtration. Basic differential equation, solutions. Measurement of filtration parameters. Example. Liquid and gas filters. 4. Heat transfer. Calculation of heat transfer surface. Heat transfer equations for sensible and insensible heat transport. 5. Calculation of heat transfer coefficient. Influence of finned surface. 6. Heat exchanger constructions, operation aspects. 7. Concentration rise of solutions by thermal method: evaporation. Mass and enthalpy balance equations in the case of one-effect evaporator. Determination of heat transfer surface. Vapor reuses facilities. Economical aspects of multi-effect evaporators. Evaporator constructions. 8. Solid handling in dryers. Drying mechanism. Psychometric charts and ratio. Wet bulb temperature. Use of psychometric chart, mixing of gas flows. Drying curves, drying time. Example. 9. Absorption of gases. Application. Equilibrium curve. Material balance. Operating line. Height of packed column. Method of transfer units. Number of theoretical plates. Problem to solve for absorption. Liquid-liquid extraction. Industrial applications. Requirements for the solvent. Equilibrium conditions. Triangular diagram, bimodal solubility curve basic notions: distribution coefficient, mass ratio, liquid (solvent to feed ratio), extraction factor. Solvent recovery. Extraction methods. Single stage batch extraction. Multiple contact batch extraction. Perforation. Countercurrent extraction. Extraction calculations. Extraction equipment. Solid-liquid extraction. Steps of the process. Equipment. Factors determining the method of extraction. Factors influencing the rate of the process. Adsorption. Adsorbents and adsorption processes. Fixed-bed adsorbers. Gas drying equipment. Pressure-swing adsorption. Adsorption from liquids. Adsorption isotherms. Types of isotherms. Concentration patterns in fixed beds. Breakthrough curves. Scale up. Length of unused bed. effect of feed concentration URL: http://www.epget.bme.hu/hu/14-oktatas/bsc/162-processes-and-equipment-of-chemical-industry

Subject code	Subject name	Requirement	ECTS credit
BMEGEÉEBX5A	Energy in buildings	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	A05	English	
Practice	A06	English	

Subject code	Subject name	Requirement	ECTS credit
BMEGEÉEBX7C	Renewable energy system	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	A08	English	
Lecture	A07	English	

Subject code	Subject name	Requirement	ECTS credit
BMEGEENBGHK	Heat Transfer G	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	24-2-DEU-E	German	
Lecture	24-2-ENG-E	English	MON:16:15-18:00(D224)
Practice	24-2-ENG-G1	English	WED:10:15-12:00(D318)
Practice	24-2-DEU-G	German	

Subject code	Subject name	Requirement	ECTS credit
BMEGEENBKSD	Final project	Mid-semester mark	15

Course type	Course code	Course language	Timetable information
Practice	24-2-ENG-G	English	

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Subject code	Subject name	Requirement	ECTS credit
BMEGEENMLCA	LCA of Power Generation Systems	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	24-2-ENG-LAB	English	
Lecture	24-2-ENG-E	English	

AimThe course aims to study the environmental impact of energy production systems. Students learn the basic concepts, standards, most commonly used types and areas of application of life cycle assessment (LCA). In their semester project assignment, students determine the environmental impact of an energy system of their choice using life cycle assessment methodology. Within the framework of their project task, they learn to use the software required for modern life cycle analysis (e.g. openLCA, GaBi, EASETECH).Learning outcomesCompetences that can be acquired by completing the courseKnowledgeThe student is aware of the principles and importance of a life cycle approach. Knows the basic concepts of life cycle assessment (LCA), the most commonly used types and standards. Has comprehensive knowledge of life cycle assessment methodology. The student is informed about the environmental quantities typical of energy production and user (production) facilities. Knows the databases, models and software that can be used during life cycle assessment. Understands the dangers of shifting impacts between different environmental impact categories. The student is aware of the basic environmental mechanisms of different environmental impact categories. Understands the application areas of life cycle assessment and the specifics of each area for LCA. The student is informed about the range, types, and availability of primary and secondary data that can be used in a life cycle assessment. Understands the process of critically reviewing the results of life cycle assessment and the methods of assessing data quality.AbilityDescribes real technology systems with life cycle models. The student is able to assess environmental impacts in multiple ways. The student can identify complex environmental problems, explore, formulate and (using learned practical application) the theoretical and practical background needed to analyze them. The student solves complex, computationally intensive tasks using IT skills. The student can express his or her thoughts orally and in writing. Interprets the results of a life cycle assessment (LCA). Creates the conceptual life cycle model using the appropriate target software. Selects secondary data sources and databases for the life cycle model. Defines the life cycle boundaries of energy systems. Use the life cycle assessment results in the application areas that meet the set goals.AttitudeThe student constantly monitors his or her work, results and conclusions. The student expands his or her knowledge of energy management and sustainability through continuous learning. Open to the use of information technology tools. The student seeks to learn about and routinely use environmental tools needed to solve energy management problems. The student develops the ability to provide accurate and error-free problem solving, engineering precision and accuracy. The student applies energy efficiency, sustainability and environmental awareness in solving life cycle assessment tasks. The student monitors changes in legislation. The student publishes his or her results under professional rules. The student publishes his or her opinions and views without offending others.General rulesLearning outcomes are assessed based on two mid-year has written performance measures (one partial and one summative academic performance assessment). Summarizing academic performance evaluation: a complex, written way of evaluating the competence-type competence elements of the subject and knowledge in a closed examination, the dissertation asks for the necessary lexical knowledge during the performance evaluation. The available working time is 30 minutes. Partial performance evaluation (project task): a complex way of evaluating the knowledge, ability, attitude, and independence and responsibility type competence elements of the subject, which is the individual homework.Assessment methodsDetailed description of mid-term assessmentsMid-term assessment No. 1Type:diagnostic assessmentNumber:1Purpose, description:Checking knowledge-type competencies in writing (level assessment) is necessary to complete the subject successfully. The evaluation will take place in electronic form at the lecture, with a maximum duration of 30 minutes and 30 points. The summative assessment can be improved/replaced during the replacement period. ---------- ----------.Mid-term assessment No. 2Type:formative assessment, project-based, complexNumber:1Purpose, description:The basic aim of the partial performance assessment is to examine the existence of application skills and learning outcomes

belonging to the attitude, autonomy and responsibility competence group. The way to do this is to create a life cycle model in 2-3 groups and then present the results to the laboratory practice group. The topic of the tasks is chosen individually, but it is also possible to choose from a predefined list. The chosen topics must be finalized by the third week of education. The requirements and evaluation principles of the prepared model are included in terms of reference. The students can get up to 70 points with this task.Detailed description of assessments performed during the examination periodThe subject does not include assessment during the examination period.The weight of mid-term assessments in signing or in final gradingIDProportionMid-term assessment No. 130 %Mid-term assessment No. 270 %The weight of partial exams in gradeThere is no exam belongs to the subject.Determination of the gradeGradeECTSThe grade expressed in percentsvery good (5)Excellent [A]above 90 %very good (5)Very Good [B] 85 % - 90 %good (4)Good [C]72 % - 85 %satisfactory (3)Satisfactory [D]65 % - 72 %sufficient (2)Pass [E]50 % - 65 %insufficient (1)Fail [F]below 50 %The lower limit specified for each grade already belongs to that grade.Attendance and participation requirementsThe lack of the value means that there is no attendance requirement.At least#160;70% of#160;laboratory practices (rounded down) must be actively attended.#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEENNKDA	Master Thesis Project A	Mid-semester mark	15

Course type	Course code	Course language	Timetable information
Practice	24-2-ENG-G	English	

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Subject code	Subject name	Requirement	ECTS credit
BMEGEENNKDB	Master Thesis Project B	Mid-semester mark	15

Course type	Course code	Course language	Timetable information
Practice	24-2-ENG-G	English	

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Subject code	Subject name	Requirement	ECTS credit
BMEGEENNWAT	Advanced Thermodynamics	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	24-2-ENG-E	English	TUE:10:15-12:00(D224)
Practice	24-2-ENG-G2	English	THU:08:15-10:00(D224)
Practice	24-2-ENG-G1	English	THU:08:15-10:00(D224)

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Subject code	Subject name	Requirement	ECTS credit
BMEGEENNWCO	Combustion	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Lecture	24-2-ENG-E	English	MON:10:15-12:00(D318)
Practice	24-2-ENG-G	English	TUE:12:15-14:00(D318)

.cs98C2414 {margin:12pt 0pt 12pt 0pt;text-align:justify;text-indent:0pt} .cs73E18CB{font-size:10pt;font-weight:normal;color:#000000;background-color:transparent;font-style:normal;font-family:Verdana;} .cs5CC07D4{margin:12pt 0pt 12pt 0pt;text-align:left;text-indent:0pt}
Important note: ONLY FOR MSc STUDENTS!According to the rules, any MSc student can be enrolled. However, this subject strongly builds on your existing Fluid dynamics, Thermodynamics, and Heat transfer knowledge. Completion of Heat engines is recommended.CONTENTS:https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEENNWCOThis subject is discussing combustion from both fundamental (first half of the semester) and practical point of views (second half of the semester).1. Introduction, administration. State-of-the-art devices and technologies. Gross reactions.2. Flame stabilization, fluid dynamics, and non-dimensional numbers.3. Reaction pathways and pollutant formation.4. Fuel properties in general.5. Gaseous, liquid, and solid fuels.6. Fuel evaporation.7. Midterm exam 1.8. Combustion modes and turbulence.9. Combustion safety and control.10. Free jet and gas burners.11. Atomization and liquid fuel burners.12. Solid fuel burners.13. Modern combustion chambers.14. Midterm exam II.REQUIREMENTS2 midterm exams1 project/homework

Subject code	Subject name	Requirement	ECTS credit
BMEGEENNWPR	Teamwork Project	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Laboratory	24-2-ENG-LAB	English	

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ONLY FOR MSc STUDENTS!
https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEENNWPR

Subject code	Subject name	Requirement	ECTS credit
BMEGEENNWTP	Thermal Physics	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	24-2-ENG-LAB	English	THU:17:15-18:00(D216)
Lecture	24-2-ENG-E	English	THU:16:15-17:00(D216)

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ONLY FOR MSc STUDENTS!
https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEENNWTP

Subject code	Subject name	Requirement	ECTS credit
BMEGEGIBXCA	Introduction to CAD	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	ERASMUS1	English	MON:08:15-10:00(R110,R109)
Laboratory	ERASMUS2	English	WED:12:15-14:00(D303)
Lecture	A_EA	English	WED:08:15-10:00(R108)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEGIBXCA

Subject code	Subject name	Requirement	ECTS credit
BMEGEGTAG92	Machine tools and manufacturing systems	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	1	English	FRI:10:15-12:00(T47)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEGTAG92#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEGTBG01	Manufacturing	Exam	5

Course type	Course code	Course language	Timetable information
Laboratory	GA3	English	FRI:12:15-14:00
Lecture	A0	English	THU:14:15-16:00(G116)
Practice	GA1	English	WED:14:15-16:00(G113)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEGTBG01#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEGTNWAM	Advanced Manufacturing	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Laboratory	A2	English	FRI:09:15-12:00(G116)
Lecture	A1	English	FRI:08:15-09:00(G116)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEGTNWAM#160;#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEMIBXGI	Mechanical engineering informatics	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Laboratory	24t_A_L02	English	THU:10:15-12:00(D502); FRI:10:15-12:00(D502)
Laboratory	24t_A_L01	English	THU:08:15-10:00(D502); FRI:08:15-10:00(D502)
Lecture	24t_A_E	English	FRI:12:15-14:00(D401)

Subject code	Subject name	Requirement	ECTS credit
BMEGEMIBXMT	Measurement techniques	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	24t_A_L01	English	TUE:10:15-12:00(D532)
Laboratory	24t_A_L02	English	TUE:10:15-12:00(D532)
Lecture	24t_A_E	English	MON:12:15-14:00(D401)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEMIBXMT#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEMMBXM4	Vibrations	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	LEC	English	TUE:12:15-14:00(KF83)
Practice	SEM1	English	TUE:14:15-15:00(KF83)

Subject code	Subject name	Requirement	ECTS credit
BMEGEMMBXN2	Strength of materials	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	LEC	English	TUE:14:15-16:00(KF87)
Practice	SEM1	English	THU:12:15-14:00(KF87)

Subject code	Subject name	Requirement	ECTS credit
BMEGEMMNWAM	Advanced Mechanics	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	LEC	English	MON:16:15-18:00(KF81); THU:16:15-17:00(KF81)

Subject code	Subject name	Requirement	ECTS credit
BMEGEMMNWMV	Machine Tool Vibration	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	LEC	English	MON:16:15-18:00(MM_I29)

Subject code	Subject name	Requirement	ECTS credit
BMEGEMTAGE3	Novel engineering materials	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	Ea	English	TUE:12:15-14:00(MT103)

BSc in Mechanical Engineering 2N-AG0/2NAAG0 Design and Technology Specialization compulsory / elective subject SUBJECT DATA SHEET AND REQUIREMENTS last modified: 29th May 2014 NOVEL ENGINEERING MATERIALS KORSZERŰ MÉRNÖKI ANYAGOK 1 Code Semester Nr. or fall/spring Contact hours/week (lect.+semin.+lab.) Requirements p / e / s Credit Language BMEGEMTAGE3 spring 2+0+0 p 3 English 2. Subject's responsible: Name: Position: Affiliation (Department): Dr. István Mészáros associate professor Dept. of Materials Science and Engineering 3. Lecturer: Name: Position: Affiliation (Department): Dr. István Mészáros associate professor Dept. of Materials Science and Engineering 4. Thematic background of the subject: The subject gives an introduction to the up-to-date research fields of materials science. Special attention is paid to the novel materials used in engineering appications. 5. Compulsory / recommended prerequisites: Compulsory: (subject's name, code) Suggested: (subject's name, code) 6. Main aims and objectives, learning outcomes of the subject: The structure, properties of novel structural and functional materials used in mechanical and electrical engineering applications and their testing methods are discussed. The technological processes and their practical aspects are discussed. Fundamental concepts of material structures and the principles of material properties and their relations. Special attention is paid to materials used in the electronics industries including their production and technological usability. 7. Method of education: Lecture 2 h/w, seminar 0 h/w, laboratory 0 h/w 8. Detailed thematic description of the subject (by topic, min. 800 character): Topics include: Basics of crystallography, crystal defects, dimensional effects, nano-, micro-, and macrostructures, multi-component systems. Thermal behavior, diffusion mechanisms. Phase transformations, heat treatments, recrystallization. Mechanical properties and their measurements. Types and properties of novel structural and stainless steels. Fundamental new concepts in steel development. High entropy alloys. Alloys used in biomedical engineering applications. Materials deterioration processes such as corrosion, fracture, fatigue (mechanical, thermal, etc.), creep, migration. Microscopy, electron microscopy, X-ray diffraction. Conduction properties, conductive, superconductive, resistive, and insulator materials. Semiconductor materials. Effects of material properties on semiconductor materials used in microelectronics and in integrated optoelectronics. Insulator, dielectric and ferro-electric materials. Production of semiconductor single crystals and the related measurement techniques (Hall, CV). Non-metallic materials in electrotechnics. Magnetic properties and the types of magnetic materials used in industrial applications. Intelligent materials. Shape memory and superelastic alloys. 9. Requirements and grading a) in term-period: participation on lectures, mid-semester test in the 7th week of the semester b) in examination period: written and oral exam c) Disciplinary Measures Against the Application of Unauthorized Means at Mid-Terms, Term-End Exams and Homework Supplement to 1/2013. (I. 30.) Dean's Order (Codicil): The following students are subject to disciplinary measures. (a). Those students who apply unauthorized means (book, lecture notes, etc.), different from those listed in the course requirements and/or adopted by the lecturer in charge of the course assessment, in the written mid-term exams taken, and/or invite/accept any

assistance of fellow students, with the exception of borrowing authorized means, will be disqualified from taking further mid-term exams in the very semester as a consequence of their action. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission option. Final term-end results in courses with practical mark will automatically become Fail (1), the ones with exam requirements will be labelled Refused Admission to Exams. (b). Those students whose homework verifiably proves to be of foreign extraction, or alternatively, evident results or work of a third party, are referred to as their own, will be disqualified from taking further assessment sessions in the very semester as a consequence of their action. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission options. Final term-end results in courses with practical mark will automatically become Fail (1), ones with exam requirements will be labelled Refused Admission to Exams. (c). Those students who apply unauthorized means (books, lecture notes, etc.), different from those listed in the course requirements and/or adopted by the lecturer in charge of the course assessment, in the written term-end exams taken, and/or invite/accept any assistance of fellow students, with the exception of borrowing authorized means, will immediately be disqualified from taking the term-end exam any further as a consequence of their action, and will be inhibited with an automatic Fail (1) in the exam. No further options to sit for the same exam can be accessed in the very same exam period. (d) Those students who alter, or make an attempt to alter the already corrected, evaluated, and distributed test or exercise/problem, i.) as a consequence of their action, will be disqualified from further assessments in the respective semester. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission options. Final term-end results in courses with practical mark will automatically become Fail (1), the ones with exam requirements will be labelled Refused Admission to Exams; ii.) and will immediately be inhibited with an automatic Fail (1) in the exam. No further options to sit for the same exam can be accessed in the very same exam period. 10. Retake and repeat 11. Consulting opportunities: Consultation hours: By email appointments 12. Reference literature (compulsory, recommended): · Books: W.D. Callister: Materials Science and Engineering (John Whiley and Sons, ISBN: 0-471-32013-7), D.C. Jiles: Principles of Materials Evaluation (CRC Press, ISBN: 13-978-0-8493-7392-3) · Downloadable materials: www.att.bme.hu 13. Home study required to pass the subject: Contact hours 28 h/semester Home study for the courses 28 h/semester Home study for the mid-semester checks 10 h/check Preparation of mid-semester homework - h/homework Home study of the allotted written notes 9 h/semester Home study for the exam 15 h/semester Totally: =90 h/semester 14. The data sheet and the requirements are prepared by: Name: Title: Affiliation (Department): Dr. István Mészáros associate professor Dept. of Materials Science and Engineering v\:* {behavior:url(#default#VML);} o\:* {behavior:url(#default#VML);} w\:* {behavior:url(#default#VML);} .shape {behavior:url(#default#VML);} /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Normál táblázat"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-qformat:yes; mso-style-parent:""; mso-padding-alt:0cm 5.4pt 0cm 5.4pt; mso-para-margin:0cm; mso-para-margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:10.0pt; font-family:"Times New Roman","serif";}

Subject code	Subject name	Requirement	ECTS credit
BMEGEMTBGA1	Materials science and testing	Exam	6

Course type	Course code	Course language	Timetable information
Laboratory	AL1B	English	MON:14:15-16:00
Laboratory	AL1A	English	MON:14:15-16:00
Laboratory	AL2A	English	MON:14:15-16:00
Laboratory	AL2B	English	MON:14:15-16:00
Lecture	AEa	English	WED:10:15-12:00(MT103); THU:14:15-16:00(G120)

Subject code	Subject name	Requirement	ECTS credit
BMEGEMTBVS2	Integrity of engineering structures 2	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	Ea	German	

Subject code	Subject name	Requirement	ECTS credit
BMEGEPTBG01	Polymer Materials Science and Engineering	Exam	6

Course type	Course code	Course language	Timetable information
Laboratory	LAB	English	FRI:08:15-10:00(MT_PTLAB)
Lecture	LECT	English	WED:08:15-10:00(KF82); THU:08:15-10:00(KF82); THU:08:15-10:00(KF82)

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SUBJECT DATASHEET:https://oktatas.gpk.bme.hu/tad/en/tantargy/1215/nyomtat

Subject code	Subject name	Requirement	ECTS credit
BMEGEPTBGE1	Composites technology	Exam	4

Course type	Course code	Course language	Timetable information
Laboratory	LAB	English	MON:14:15-16:00(MT_PTLAB)
Lecture	LECT	English	MON:10:15-12:00(T200)

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Subject datasheet:https://oktatas.gpk.bme.hu/tad/en/tantargy/1016/nyomtat

Subject code	Subject name	Requirement	ECTS credit
BMEGEVÉAG03	Processes and Equipment of Chemical Industry	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	A46	English	
Practice	A47	English	

Aim of the subject: Theory and practice of mechanical, hydromechanical, thermal, and diffusion processes often used in chemical, food industry, biotechnology and environmental protection. Equipment, sizing and operation aspects. Topics of the subject: 1. Size reduction, milling. Liquid mixing. Types of impellers, baffles. Power number function. Example. Non-Newtonian liquids and their mixing. Settling in gravitation. Suspension types, measurement of settling velocity. Example. 2. Settling in centrifuges, Construction and operation of cyclones. Separation efficiencies. 3. Surface filtration. Basic differential equation, solutions. Measurement of filtration parameters. Example. Liquid and gas filters. 4. Heat transfer. Calculation of heat transfer surface. Heat transfer equations for sensible and insensible heat transport. 5. Calculation of heat transfer coefficient. Influence of finned surface. 6. Heat exchanger constructions, operation aspects. 7. Concentration rise of solutions by thermal method: evaporation. Mass and enthalpy balance equations in the case of one-effect evaporator. Determination of heat transfer surface. Vapor reuses facilities. Economical aspects of multi-effect evaporators. Evaporator constructions. 8. Solid handling in dryers. Drying mechanism. Psychometric charts and ratio. Wet bulb temperature. Use of psychometric chart, mixing of gas flows. Drying curves, drying time. Example. 9. Absorption of gases. Application. Equilibrium curve. Material balance. Operating line. Height of packed column. Method of transfer units. Number of theoretical plates. Problem to solve for absorption. Liquid-liquid extraction. Industrial applications. Requirements for the solvent. Equilibrium conditions. Triangular diagram, bimodal solubility curve basic notions: distribution coefficient, mass ratio, liquid (solvent to feed ratio), extraction factor. Solvent recovery. Extraction methods. Single stage batch extraction. Multiple contact batch extraction. Perforation. Countercurrent extraction. Extraction calculations. Extraction equipment. Solid-liquid extraction. Steps of the process. Equipment. Factors determining the method of extraction. Factors influencing the rate of the process. Adsorption. Adsorbents and adsorption processes. Fixed-bed adsorbers. Gas drying equipment. Pressure-swing adsorption. Adsorption from liquids. Adsorption isotherms. Types of isotherms. Concentration patterns in fixed beds. Breakthrough curves. Scale up. Length of unused bed. effect of feed concentration URL: http://www.epget.bme.hu/hu/14-oktatas/bsc/162-processes-and-equipment-of-chemical-industry

Subject code	Subject name	Requirement	ECTS credit
BMEGEVGBG06	Individual project 1.	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	AnL-HDR	English	
Laboratory	AnL-ÉPGET	English	
Laboratory	AnL-ARA	English	
Laboratory	AnL-EGR	English	

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEVGBG06#160;Independent Study 1 BMEGEVGBG06 One-semester long individual project work. 4 hours/4 credits.

Subject code	Subject name	Requirement	ECTS credit
BMEGEVGBV08	Individual project 2.	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	AnL-HDR	English	

Subject code	Subject name	Requirement	ECTS credit
BMEGEVGBX01	Fluid Machinery	Exam	4

Course type	Course code	Course language	Timetable information
Laboratory	AnLlan	English	FRI:08:15-10:00(L-HIDROLAB)
Laboratory	AnLpar	English	FRI:08:15-10:00(L-HIDROLAB)
Lecture	AnE	English	WED:08:15-10:00(KF84)

Practice	AnGypar	English	FRI:08:15-10:00(KF85)
Practice	AnGylan	English	FRI:08:15-10:00(KF85)

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEVGBX01#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEVGNW21	Unsteady Flow in Pipe Networks	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	AnE	English	
Practice	AnGy	English	

Subject code	Subject name	Requirement	ECTS credit
BMEGEVGNWPR	Teamwork Project	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Laboratory	AnL	English	

https://oktatas.gpk.bme.hu/tad/en/tantargy/BMEGEVGNWPR#160;

Subject code	Subject name	Requirement	ECTS credit
BMEGEVGNX28	Theoretical acoustics	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	AnE	English	WED:12:15-14:00(D327)

Faculty of Natural Sciences

IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully.Civil Engineering courses are on the website seperately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

Subject code	Subject name	Requirement	ECTS credit
BMETE11AP59	Mechanics	Exam	8

Course type	Course code	Course language	Timetable information
Lecture	T0	English	
Practice	T2	English	
Practice	T3	English	
Practice	T1	English	

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Introductory course to mechanincs, with special emphasis on the basic physical and mathematical methods and terms. I. Kinematics: basic terms, mass point. Force. Newton’s laws. Momentum. Gravitation, inertial mass and weight, choice of units. Examples from dynamics, describing motion in different reference frames, the principle of relativity, inertial forces in accelerating and rotating reference frames. Work, kinetic and potential energy. System of mass points, conservation laws in mechanics. The statics, kinematics and dynamics of rigid bodies (rotation around a fixed axis, inertial moment, free axes, gyroscope with and without weight). Elastic deformation of solid bodies. Liquids and gases: statics, surface effects, frictionless and viscous flow, forces on a moving body moving in a medium. II. Oscillations: free, harmonic, damped, forced. Decomposition and superposition of vibrations. Coupled oscillations. Waves and wave function. Harmonic wave, phase velocity, non-harmonic waves, group velocity. Wave equation in an elastic rod, propagation of energy in a wave. Polarization. Reflection and refraction. Interference, coherence, diffraction. Standing waves. Wave equation in a gas and on a string. Standing wave equation, whistles, strings, the physics of music. Doppler shift. Ultrasonic diagnostics. – Raymond A. Serway, John W. Jewett: Physics for Scientists and Engineers (Cengage Learning; 10th edition, 2018) ISBN 978-1337553278– Herman Gewirtz, Jonathan S. Wolf: Barron's SAT Subject Test in Physics 9th Edition (Barron’s, 2010) ISBN 978-0-7641-4353-3

Subject code	Subject name	Requirement	ECTS credit
BMETE11AX22	Physics 2	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	VE0	English	TUE:12:15-14:00
Lecture	VN0	German	
Practice	VE1	English	TUE:14:15-16:00
Practice	VN1	German	

Elektrodynamics: Faradayrsquo;s law. Self induction, mutual induction. Magnetic properties of materials. Magnetic data storage. Maxwell equations. Generation, propagation and reflection of electromagnetic waves. Basics of geometrical optics. Wave optics, interference, diffraction. Polarized light. Basics of atomic Physics: Natural and coherent light sources. Physical foundations of optical communication. Matter waves of de Broglie. The Schrouml;dinger equation. The electron structure of atoms. Electron spin. Free-electron theory of metals. Band structure of solids. Superconduction. Quantum-mechanical phenomena in modern electronics. Basics of nuclear physics. Nuclear reactors. Elementary particles. Curiosities in cosmology. Fundamentals of the physics of the atomic kernel, elementary particles, selected topics in cosmology.

Subject code	Subject name	Requirement	ECTS credit
BMETE15MF10	Random Matrix Theory and Its Physical Applications	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	T0	English	

Random matrix theory provides an insight of how one can achieve information relatively simply about systems having very complex behavior. The subject based on the knowledge acquired in quantum mechanics and statistical physics together with some knowledge of probability theory provides an overview of random matrix theory. The Dyson ensembles are defined with their numerous characteristics, e.g. the spacing distribution, the two-level correlation function and other quantities derived thereof. Then the thermodynamic model of levels is obtained

together with several models of transition problems using level dynamics. Among the physical applications the universality classes are identified in relation to classically integrable and chaotic systems. The problem of decoherence is studied as well. Then the universal conductance fluctuations in quasi-onedimensional disordered conductors are investigated. Other models are investigated: the disorder driven Anderson transition and the random interaction model of quantum dot conductance in the Coulomb-blockade regime. We use random matrix models to investigate chirality in two-dimensional and Dirac systems and the normal-superconductor interface. The remaining time we cover problems that do not belong to strictly physical systems: EEG signal analysis, covariance in the stock share prize fluctuations, mass transport fluctuations, etc.

Subject code	Subject name	Requirement	ECTS credit
BMETE15MF11	Evolutionary Game Theory	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	T0	English	FRI:10:15-12:00

The main goal of this course is to demonstrate the ways how the game theory and evolutionary game theory describe real-life situations affecting human behavior, economics, and biological systems. After a brief survey of the basic concept of the traditional game theory (e.g., games, strategies, Nash equilibrium, etc.) we will study evolutionary games that combine the concepts of game theory with the spirit of Darwinism. We will discuss the decomposition of games and also the potential games related to physical systems. Using simple multi-agent mathematical models we will investigate the effects supporting the maintenance of cooperative behavior in the situations of different social dilemmas (e.g., prisoner's dilemma or public goods game) when the individual interests prefer defection to cooperation. The predictions of the mathematical models will be contrasted with human and animal experiments. Finally we study systems where the evolution is controlled by the competition between different spatial strategy associations.

Subject code	Subject name	Requirement	ECTS credit
BMETE15MF21	Crystalline and Amorphous Material	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	T0	English	

1. Introduction 1.1. Historical overview: Science and applications 1.2. Definitions Crystalline, non-crystalline, amorphous, glassy materials, 2. Preparation techniques 2.1. Growth of thin-film forms 2.2. Melt-quenched glasses 2.3. Other techniques 2.4. Phillips constraints theory 3. Structure 3.1. Differences between amorphous and crystalline semiconductors 3.2. Projection from three dimensional structures to one dimensional functions Diffraction measurements 3.2. Three dimensional structure derivation from one dimensional function 3.3. Atomic interactions. Computer simulation methods, Models 3.4. Phase change materials and its application 4. Electronic structure 4.1. Chemical bonds, 4.2. Electronic density of states, 4.3. Defects 4.4. Optical and electronic properties 5. Photo induced phenomena 5.1. Photoinduced volume changes (PVE), photodarkening, photobleaching (PD), 5.2. Photoinduced defect creation (PDC): the Staebler-Wronsky effect, 5.3. In-situ simultaneous measurements of PVE, PD, and PDC 5.4. Photoinduced amorphization or crystallization, 5.5. Some applications of photo-induced effects (solar cells, XEROX, sensors, DVD, etc.)

Subject code	Subject name	Requirement	ECTS credit
BMETE15MF74	Computer Simulation in Physics	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Lecture	TA1	English	THU:18:15-19:00(F3213)
Lecture	TA0	English	THU:16:15-18:00(F3213)

Subject code	Subject name	Requirement	ECTS credit
BMETE15MF76	Complex Networks	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	E0	English	WED:12:15-14:00
Practice	E1	English	

Basic graph theory, adjacency matrix, distance, path, connectedness, clustering. Random (Erdős-Rényi) networks, degree distribution, clustering, Watts-Strogratz network. Preferential attachment, scale free networks, configuration model. Temporal networks, burstiness. Growth models and cascades. Diffusion, spreading. Local measures, link prediction. Mesoscopic description: communities (stochastic blok model, inference, modularity, node/link hierarchical clustering, clique percolation), hierarchical, core-periphery structures. Sampling of networks. Navigation, search on networks.

Subject code	Subject name	Requirement	ECTS credit
BMETE80AF36	Introduction to Fusion Plasma Physics	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	T0	English	TUE:16:15-18:00

Subject code	Subject name	Requirement	ECTS credit
BMETE80AF45	Monte Carlo Methods	Exam	4

Course type	Course code	Course language	Timetable information
Practice	T1	English	

Subject code	Subject name	Requirement	ECTS credit
BMETE80MFAD	Monte Carlo Methods	Mid-semester mark	5

Course type	Course code	Course language	Timetable information
Lecture	T0	English	WED:12:15-14:00

Subject code	Subject name	Requirement	ECTS credit
BMETE80MX07	Radiation Protection	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	T0	English	FRI:10:15-12:00

Physical fundamentals of generating ionizing radiations: radioactivity, radioactive decay, operation of equipment for generating ionizing radiations. Definition of doses. Biological effects of ionizing radiations: deterministic and stochastic effects, somatic and genetic effects. Control of applications of ionizing radiations in connection with the explanation of generic principles of radiation#160; protection (justification, optimization, and individual limitations). Procedures and conditions of generating ionizing radiations: external and internal exposure situations, natural and artificial radioactivity. Practical implementation of radiation protection: workplace and environmental radiation protection, monitoring, management and disposal of radioactive wastes, applications of radiation shielding. management of nuclear and radiological emergencies.#160;H. Cember, T.E. Johnson: Introduction to Health Physics#160;

Subject code	Subject name	Requirement	ECTS credit
BMETE90AX02	Mathematics A2a - Vector Functions	Exam	6

Course type	Course code	Course language	Timetable information
Lecture	EN0-EMK	English	
Practice	EN1-EMK	English	

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

Subject code	Subject name	Requirement	ECTS credit
BMETE90AX22	Calculus 2 for Informaticians	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Lecture	EN0-EB0	English	MON:12:15-14:00; TUE:10:15-12:00
Practice	EN1-EB1	English	THU:14:15-16:00

Differential equations: Separable d.e., first order linear d.e., higher order linear d.e. of constant coefficients. Series: Tests for convergence of numerical series, power series, Taylor series. Functions of several variables: Limits, continuity. Differentiability, directional derivatives, chain rule. Higher partial derivatives and higher differentials. Extreme value problems. Calculation of double and triple integrals. Transformations of integrals, Jacobi matrix. Analysis of complex functions: Continuity, regularity, Cauchy - Riemann partial differential equations. Elementary functions of complex variable, computation of their values. Complex contour integral. Cauchy - Goursat basic theorem of integrals and its consequences. Integral representation of regular functions and their higher derivatives (Cauchy integral formulae).

Subject code	Subject name	Requirement	ECTS credit
BMETE90AX26	Mathematics A2f - Vector Functions	Mid-semester mark	6

Course type	Course code	Course language	Timetable information
Lecture	EN0-VIK	English	MON:10:15-12:00; WED:08:15-10:00

Practice	EN1-VIK	English	WED:10:15-12:00

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

Subject code	Subject name	Requirement	ECTS credit
BMETE90AX34	Mathematics EP2	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Practice	EN1	English	WED:08:15-10:00

Limit, continuity, partial derivatives and differentiability of functions of multiple variables. Equation of the tangent plane. Local extrema of functions of two variables. Gradient and directional derivative. Divergence, rotation. Double and triple integrals and their applications. Polar coordinates. Substitution theorem for double integrals. Curves in the 3D space, tangent line, arc length. Line integral. 3D surfaces. Separable differential equations, first order linear differential equations. Algebraic form of complex numbers. Second order linear differential equations with constant coefficients. Taylor polynomial of exp(x), sin(x), cos(x). Eigenvalues and eigenvectors of matrices.

Subject code	Subject name	Requirement	ECTS credit
BMETE91AM43	Informatics 2	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	WED:16:15-18:00
Lecture	EN0	English	WED:10:15-11:00

The course aims to learn the programming through understanding the Python language. Introduction to programming and Python language, data types, expressions, input, output. Control structures: if, while. Flowchart, structogram, Jackson figures. Complex control structures. Fundamental algorithms (sum, selection, search extrema, decision..., many practical examples). Lists. For cycle. Newer algorithms (sorting, splitting into two lists...). Exception handling. Abstraction of a part of the program, name it, using as a building block = function. Function call process, parameters, local variables, passing by value. Abstraction: complex data types from simple ones, for example fraction (numerator + denominator), complex numbers (real amp;amp; imaginary part). OOP concepts: object, method. File management. Command-line arguments. Recursion (painting of an area, building a labyrinth). Algorithms efficiency, quick sorting, binary search versus linear search, O(n). Data structures: binary tree (algorithms), effectiveness: search trees (Morse tree). Mathematical libraries. Modules.

Subject code	Subject name	Requirement	ECTS credit
BMETE91AM44	Informatics 3	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Laboratory	EN1	English	WED:12:15-14:00
Lecture	EN0	English	TUE:12:15-14:00

The aim of the course is to understand the basic elements of C++ language fundamental in effective scientific calculations. Compiling C++ programs, programming environments for C++. Input/Output. Built-in data types: int, double, char, bool, complex. Control commands: if, switch, for, while, do. Exception handling(recall Python). Functions. Extending operators (fractions struct), references (a += b, cout lt;lt; fraction, cin gt;gt; fractions). Object-oriented programming in C++: object, class, encapsulation, member functions, constructors, destructors (in complex class with re + im or r + fi data members). Using arrays in C++. Pointers, relationship with arrays. File management. Basic algorithms: search, sort, etc. Command-line arguments. Dynamic memory management, new[], delete[]. Inheritance. Templates. Libraries. Header files.– E. Scheinerman: C++ for Mathematicians. An Introduction for Students and Professionals, CRC Press

Subject code	Subject name	Requirement	ECTS credit
BMETE91AM59	Number Theory	Exam	2

Course type	Course code	Course language	Timetable information
Lecture	T0	English	WED:16:15-18:00

Basic Number Theory: Divisibility, greatest common divisor, Euclid's algorithm, congruences, Chinese remainder theorem, Hensel lifting, primitive roots, discrete logarithm, quadratic residues, Legendre and Jacobi symbol. Law of quadratic reciprocity. Analytic Number Theory: Prime numbers and its properties, primes of special forms. Primes in arithmetic progressions, gaps between primes, Bertrand's postulate, the Prime Number Theorem. The Riemann zeta function, Riemann Hypothesis, Dirichlet characters. The generating function and its applications, partitions. Sieve

methods, application of Brun's sieve to estimate the number of#160; twin primes, Goldbach's conjecture. Additive and multiplicative arithmetic functions. Additive Number Theory: Sumsets, direct and inverse problems. Sum-product estimates.#160;Combinatorial Number Theory: Schnirelman density, Schur's theorem,#160; van der Waerden's theorem, Szemerédi's theorem about arithmetic progressions. Zero-sum combinatorics: the polynomial method, Combinatorial Nullstellensatz, applications.#160;Diophantine equations: sum of two, three, four squares, representations as the sums of k-th powers, Waring problem.#160; Fermat's last theorem.#160; Mordell equation. The abc conjecture. Miscellaneous modern topics (sketch only):#160;Number Theory in Cryptography: The RSA and the ElGamal scheme. Primality tests.#160;Diophantine Approximation Theory: Continued fractions. Pell equation. Wiener attack against RSA. p-adic numbers.#160;

Subject code	Subject name	Requirement	ECTS credit
BMETE93BG02	Mathematics G2	Exam	6

Course type	Course code	Course language	Timetable information
Lecture	EN0	English	TUE:16:15-19:00(KF81); WED:16:15-17:00(KF81)
Practice	EN1	English	WED:17:15-19:00(KF81)

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

Faculty of Transportation Engineering and Vehicle Engineering

IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully.Civil Engineering courses are on the website seperately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

Subject code	Subject name	Requirement	ECTS credit
BMEKOALM244	City logistics	Exam	5

Course type	Course code	Course language	Timetable information
Lecture	ERA_EA	English	THU:12:15-14:00
Practice	ERA_GYAK	English	THU:14:15-16:00

Subject code	Subject name	Requirement	ECTS credit
BMEKOGGM614	Research and devlopment process in the vehicle industry	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	ERA_EA	English	TUE:08:15-10:00

Subject code	Subject name	Requirement	ECTS credit
BMEKOKAM703	Safety and reliability in vehicle industry	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	ERA ea	English	THU:08:15-10:00

Subject code	Subject name	Requirement	ECTS credit
BMEKOKGA226	Airtransport Management I.	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	ERA_L	English	THU:12:15-14:00
Practice	ERA_P	English	THU:12:15-14:00

Market of air transport. Strategy. Marketing. Controlling. Charges. Airlines and airports.

Subject code	Subject name	Requirement	ECTS credit
BMEKOKK8508	Innovation and entrepreneurship in transportation	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	ERA_ l	English	TUE:16:15-17:00
Practice	ERA_ p	English	TUE:17:15-18:00

Subject code	Subject name	Requirement	ECTS credit
BMEKOKK8510	Disruptive Transformation of the Truck Industry I.: Legislative, Business, and Market Changes and Challenges"	Mid-semester mark	2

Course type	Course code	Course language	Timetable information
Lecture	era_l	English	THU:14:15-15:00
Practice	era_p	English	THU:15:15-16:00

Subject code	Subject name	Requirement	ECTS credit
BMEKOKKM222	Road Safety	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Lecture	ERA_L	English	WED:10:15-12:00
Practice	ERA_P	English	WED:08:15-10:00

Subject code	Subject name		Requirement	ECTS credit
BMEKOKKM230	Environmental effects of transport		Mid-semester mark	4
Course type	**Course code**	**Course language**	**Timetable information**	
Lecture	ERA_L	English	WED:10:15-12:00	
Practice	ERA_p	English	WED:08:15-10:00	

Subject code	Subject name		Requirement	ECTS credit
BMEKOKUM205	Intelligent Transport Systems		Exam	5
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	ERA LAB	English	TUE:14:15-16:00	
Lecture	ERA L	English	WED:16:15-18:00	

Subject code	Subject name		Requirement	ECTS credit
BMEKOVRM121	Numerical methods		Mid-semester mark	4
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	Lab_ERA	English	THU:18:15-20:00	
Lecture	EA_ERA	English	THU:16:15-18:00	

Subject code	Subject name		Requirement	ECTS credit
BMEKOVRM235	Air Traffic Control		Exam	4
Course type	**Course code**	**Course language**	**Timetable information**	
Laboratory	ERA_LAB	English	WED:14:15-16:00	
Lecture	ERA_EA	English	TUE:10:15-12:00	