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
BMEGEENBGHK	Heat transfer G	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	21-2-DEU-E-TÁV	German	
Practice	21-2-DEU-G-TÁV	German	

Subject code	Subject name	Requirement	ECTS credit
BMEGEENBGKG	Heat Engines G	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	21-2-ENG-E-JEL	English	WED:12:15-14:00
Practice	21-2-ENG-G-JEL	English	WED:14:15-16:00(D224)

The course aims to give a general overview about operation of equipmentsbased on thermodynamical cycles and shows how real processes arerunning inside these equipments. Basics of combustion technology will be introduced also, because in most of the cases heat is gained from combustion. A lot of everyday life energy utilization procedure or system operation is made understandable e.g. principals of firing from camp-fires or domestic heaters to power station boilers, operation principals of air-conditioning, heat pump, steam- and gas-turbine internal combustion engine. Environmental effects and pollution if any will be introduced as well..Knowledge competence s: The students will... Understand basic principals of combustion technology. Identify pollutants and reduction possibilities generated during combustion processes. Be aware of processes running in domestic and industrial boilers. Informed about design and energy flow principals of impulse stage turbines. Familiar with design and energy flow principals of reaction stage turbines. Has knowledge about design principals of compressors, turbines and combustion chambers of industrial gas turbines. Familiar with main features and design principals of aviation gas turbines. Describe energy transformation procedures in gas turbines. Has basic knowledge about design and process principals of spark and compression ignition engines. Familiar with operation principals of vapor compression cooling. Skill competence, The students will be able to… Identify combustion processes flowing in real fired equipments. Describe real systems with abstract thermodynamical models. Calculate with mathematical models process values of thermodynamical systems. Identify thermodynamical processes in thermodynamical charts. Handle complex thermodynamical procedures of real equipment. Analyze theoretical and practical backgrounds of real energy transformation processes. Apply learnt procedures to be able to follow real processes. Evaluate operational parameters of real energy related equipments. Can compute complex procedures by means of knowledge in informatics. Is able to interpret own ideas both in oral and written form. Attitude competences: The students…. Initiate cooperation with the teacher and other students. Broaden the knowledge with continues collection of informations. Open for utilisation of possibilities provided by information technology. Improve engineering tool sets applicable for problem solving related to heat engines. Follow accurate and errorless solving of process related problems. Broaden energy efficiency measures in connection with heat engines. Support environmental protection measures in connection with heat engines and energy related processes.Autonomy and responsibility competences: The students... Individually committed process follow and problem solving of thermodynamical problems by given methods. Accept reviews and critical comments related to his/her work. Cooperative with his/her team mates during solving processes. Implement systematization in his/her mind and in problem solving. Takes reponsibility for own performance by both individual and team work.

Subject code	Subject name	Requirement	ECTS credit
BMEGEENBGTD	Engineering thermodynamics G	Mid-semester mark	4

Course type	Course code	Course language	Timetable information
Lecture	21-2-ENG-E-TÁV	English	TUE:08:15-10:00
Practice	21-2-ENG-G-TÁV	English	TUE:10:15-12:00

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	21-2-ENG-LAB-TÁV	English	
Lecture	21-2-ENG-E-TÁV	English	

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

Course type	Course code	Course language	Timetable information
Practice	21-2-ENG-G	English	

In course of the Final Project A one student or group of 2 students will work on one selected challenging problem of mechanical engineering. Several experimental and/or numerical project proposals will be announced by the project leaders. The aim of the course is to develop and enhance the capability for complex problem solving of the students under advisory management of their project leader. At the end of each semester a written Project Report is to be submitted and the summary and findings of the investigations on the selected problem is to be presented as Project Presentation.

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

Course type	Course code	Course language	Timetable information
Practice	21-2-ENG-G	English	

The aim of the subject of is to demonstrate the ability of the student to solve high level, practical engineering problems, based on acquired knowledge in the fields of mechanical engineering. The projects have to be prepared by the students under the guidance of supervisors. The Final Projects include tasks in design, simulations, laboratory tests, manufacturing as well as controlling, interfacing and software tasks. The expected result is mostly a Final Report prepared according to written formal requirements. During the Final Exam, the results have to be explained in an oral presentation.

Subject code	Subject name	Requirement	ECTS credit
BMEGEENMWPR	Teamwork project	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	21-2-ENG-LAB	English	

The complex task covers a semester project in the diverse topics of energetics.

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

Course type	Course code	Course language	Timetable information
Lecture	21-2-ENG-E-TÁV	English	TUE:08:15-10:00
Practice	21-2-ENG-G2	English	
Practice	21-2-ENG-G-TÁV	English	TUE:10:15-12:00

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

Course type	Course code	Course language	Timetable information
Lecture	21-2-ENG-E-TÁV	English	MON:10:15-12:00
Practice	21-2-ENG-G-TÁV	English	TUE:12:15-14:00

Important note: 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 This 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. REQUIREMENTS 2 midterm exams 1 project/homework

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

Course type	Course code	Course language	Timetable information
Laboratory	21-2-ENG-LAB-TÁV	English	THU:17:15-18:00
Lecture	21-2-ENG-E-TÁV	English	THU:16:15-17:00

Subject code	Subject name	Requirement	ECTS credit
BMEGEGEAGMD	Machine design	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	EA	English	
Practice	G1	English	

Mechanical engineering design, development, behavior analysis (stress and stiffness analysis, reliability and service life estimates), knowledge of the behavior of mechanical structures, modeling opportunities, various aspects of the design. Learning the modeling of different characteristics, and of the finite element model creation process and the evaluation of the stress state practicing on simple structural elements.

Subject code	Subject name	Requirement	ECTS credit
BMEGEGIBGG2	Machine elements 2.	Exam	6

Course type	Course code	Course language	Timetable information
Laboratory	AL2	English	
Laboratory	AL1	English	
Lecture	A_EA	English	
Practice	AG1	English	
Practice	AG2	English	

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

Course type	Course code	Course language	Timetable information
Laboratory	AL1	English	
Laboratory	AL2	English	
Laboratory	AL3	English	
Lecture	A_EA	English	

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:12:15-14:00

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
Lecture	A1	English	FRI:08:15-09:00

Subject code	Subject name	Requirement	ECTS credit
BMEGEMIAGE1	Control Engineering	Exam	4

Course type	Course code	Course language	Timetable information
Lecture	21t_A_E	English	THU:08:15-10:00
Practice	21t_A_G	English	FRI:16:15-18:00(K155)

Modeling dynamical systems with differential equations, frequency response functions, transfer functions and state space models. Stability analysis. Basic aspects of feedback control. Analysis of dynamical control systems. PID

controller design and tuning.Topics:Introduction. Modeling physical and technical systems by differential equations. Extensive and intensive variables. Dynamic balance equations.General features of linear input-output systems. Linearization methods. Closed form solutions of first order and second order ordinary differential equations. Step response and impulse response of basic systems.State-space models of linear and nonlinear dynamic systems. Signal flow graphs. Basic principles of numerical simulation. Euler and Runge-Kutta methods. Computer program practices (MATLAB, Excel / Visual Basic, C/C++).Laplace transform, its main properties and applications.Transfer function of linear dynamic systems. Resultant transfer function of complex systems (serial, parallel connections, feedback etc.).Frequency response function. Origination from harmonic input-output. Nyquist plot and Bode plots for basic systems. (MATLAB illustrations.)Asymptotic stability, stability and instability. Conditions for the characteristic roots. Stability criteria: Mikhailov-Leonhard and Routh-Hurwitz.Stability analysis of a pendulum (normal and inverted) balancing with a proportional-integrating (PI) controller. Liquid level controlling solutions.Simplified block diagram of a general closed loop control system. The four most important transfer functions. Description with block diagrams.Type number of signals (power of time) and systems (order of integrating). Required type number of the controller for a desired steady state error.Tuning PID controller parameters for simple plants. Creating an approximately integrating open loop. Using system identification methods. Controlling a dead zone system by integrating (I) controller.Hardware devices of control (sensors, actuators, controllers).Discrete time description of dynamic systems (z-transformation). Basic principles of computer controlled systems.On-off control systems. Real world control applications.

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	FRI:10:15-12:00

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	AL2A	English	TUE:14:15-16:00
Laboratory	AL1B	English	TUE:14:15-16:00
Laboratory	AL1A	English	TUE:14:15-16:00
Laboratory	AL2B	English	TUE:14:15-16:00
Lecture	AEa	English	MON:10:15-12:00; WED:10:15-12:00

Subject code	Subject name	Requirement	ECTS credit
BMEGEMTNWMS	MATERIALS SCIENCE	Exam	3

Course type	Course code	Course language	Timetable information
Lecture	Ea	English	MON:10:15-12:00

Subject code	Subject name	Requirement	ECTS credit
BMEGEPTAG0P	Polymer Materials Science and Engineering	Exam	6

Course type	Course code	Course language	Timetable information
Laboratory	LAB_ERASMUS	English	FRI:08:15-10:00(MT_PTLAB)
Lecture	LECT_ERASMUS	English	TUE:14:15-16:00; TUE:14:15-16:00; THU:10:15-12:00

The objective is to familiarize the students with the following subjects: structure of polymers; the dependence of their properties on structure, temperature and environment; the characteristics of their stressndash;strain relationships; their basic application, processing and recycling possibilities. Introduction on materials science and polymer engineering. Evolution of polymer engineering, main directions of its development and achievements. Application of polymers as structural materials. Molecular structure of polymers, structural levels. Polymerization techniques, building of macromolecules, 3D formations of macromolecules, solubility. Polymers classification, related applications and products. Morphology of polymers. Correlation between structure and mechanical properties in polymers. Time dependency of the mechanical properties, modeling the viscoelastic properties. The effect of environmental variables on the properties of polymers. Basics of melt rheology, flow and viscosity curves. Flow of polymer melts in capillaries and in slit dies. Measure of fluidity and viscosity. Flow deviations from steady state. Polymer processing technologies, common steps of fabrication. Extrusion technology, extruder and related equipments, physical processes in the plastication unit, thermal conditions in the extruder, extruded products. Pipe extrusion die, coathanger sheet dies, extrusion blow molding, blown film extrusion, coextrusion. Film calendering. Bending of rolls, compensation possibilities. Improving the properties of films. Thermoforming of plastic sheets. Development and basics of injection molding technology. Reciprocating screw injection molding. The role, structure

and types of the mold. Special (multicomponent) injection molding technologies. Synthetic fibers. Processing technologies of crosslinked polymers: hand lay-up method, filament winding, pultrusion, moulding compounds, prepregs. Processing of elastomers (rubbers) and related machines. Polymer matrix composites. Subjects of the laboratory practices: Tensile testing of polymers, Bending of polymers, Polymer composites, Thermoforming, Injection molding, Extrusion, Melt Flow Index, Rapid prototyping and Rapid Tooling. Url/details: http://www.pt.bme.hu/targyalapadat/44_BMEGEPTAG0P_targyleiras.pdf

Subject code	Subject name	Requirement	ECTS credit
BMEGEPTAGE1	Composites technology	Exam	4

Course type	Course code	Course language	Timetable information
Laboratory	LAB_ERASMUS	English	THU:14:15-16:00(MT_PTLAB)
Lecture	LECT_ERASMUS	English	THU:10:15-12:00(K155)

Main objective is getting familiar with the matrices and reinforcing materials of polymer composites. Gaining knowledge about the manufacturing technologies of thermoplastic and thermoset matrix composites. Learning the basics of composite mechanics and composite specific design guidelines. Topics: thermoset and thermoplastic composite matrix materials, properties and applications. Typical reinforcing materials of polymer composites. Reinforcing structures, properties and applications. Manufacturing technologies of thermoset matrix polymer composites: overview, typical products, tooling materials. Wet manufacturing technologies of thermoset matrix polymer composites: hand layup, spraying, RTM, pressing, pultrusion, filament winding, braiding, centrifugal casting. Dry manufacturing technologies of thermoset matrix polymer composites: autoclave curing of prepregs, out of autoclave prepreg curing, BMC pressing, SMC pressing, sandwich manufacturing. Manufacturing technologies of thermoplastic matrix polymer composites: extrusion, injection moulding, pressing, vacuum forming, GMT. Damage and failure of polymer composites: testing and approving methodologies. Basics of composite mechanics: types of material behaviour, rules of mixtures, laminate properties for different stacking sequences, composite plates under tension, composite plates under bending, failure criteria for composites. Example problem solving.

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-ARA	English	
Laboratory	AnL-EGR	English	
Laboratory	AnL-HDR	English	
Laboratory	AnL-ÉPGET	English	

http://www.hds.bme.hu/oktatas.php?sm=1amp;lang=EN Independent Study 1 BMEGEVGAG06 One-semester long individual project work. 4 hours/4 credits.

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

Course type	Course code	Course language	Timetable information
Practice	AnGy	English	

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

Course type	Course code	Course language	Timetable information
Laboratory	AnLlan	English	WED:10:15-12:00(L-HIDROLAB)
Laboratory	AnLpar	English	WED:10:15-12:00(L-HIDROLAB)
Lecture	AnE	English	WED:08:15-10:00(K155)
Practice	AnGypar	English	
Practice	AnGylan	English	

http://www.hds.bme.hu/oktatas.php?sm=1amp;lang=EN

Subject code	Subject name	Requirement	ECTS credit
BMEGEVGBX14	Analysis of technical and economical data	Mid-semester mark	3

Course type	Course code	Course language	Timetable information
Laboratory	AnL1	English	TUE:16:15-18:00
Laboratory	AnL2	English	TUE:16:15-18:00
Lecture	AnE	English	TUE:12:15-14:00

Subject code	Subject name		Requirement	ECTS credit
BMEGEVGNKDA	Master Thesis Project A		Mid-semester mark	15
Course type	**Course code**	**Course language**	**Timetable information**	
Practice	AnGy	English		
http://www.hds.bme.hu/oktatas.php?sm=1amp;lang=EN				

Subject code	Subject name		Requirement	ECTS credit
BMEGEVGNKDB	Master Thesis Project B		Mid-semester mark	15
Course type	**Course code**	**Course language**	**Timetable information**	
Practice	AnGy	English		

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	TUE:10:15-11:00(KF82)	
Practice	AnGy	English	TUE:11:15-12:00(KF82)	