University of Dunaújváros

Mechanical Engineering BSc

study program

University of Dunaújváros

Institute of Engineering
2020.

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DESCRIPTION OF THE DEGREE STUDY PROGRAM

Mechanical Engineering BSc with Mechatronics Specialisation and Maintenance Specialisation	
The higher educational institution responsible for the study program:	Dunaújvárosi Egyetem (University of Dunaújváros)
Identification number of higher educational institution:	FI60345
Address of higher educational institution:	Táncsics Mihály utca 1/A., 2400 Dunaújváros
Authorized head of the institution	Dr. István András, Rector
Responsible persons for the study program	
Responsible institute:	Institute of Engineering Sciences
Director of institute:	Dr. Miklós Horváth, college associate professor
Responsible person for the study program:	Dr. Attila Szabó, PhD
Specializations (majors) and responsible persons:	
Mechatronics	Dr. Attila Kővári, PhD
Maintenance	Dr. Attila Szabó, PhD
Main aspects of the study program:	
Precondition of student application acceptance:	- General Certificate of Education or a certificate of secondary school final exam, that certificate, which is required to start a higher educational study program in the home country of the student, - the level of the required English language knowledge to start bachelor studies: IELTS 5.5
Level of educational program:	undergraduate
Level of qualification:	bachelor (BSc)
Description of qualification in the diploma in Hungarian	Gépészmérnök
Description of qualification in the diploma in English	Mechanical Engineer
Scheme of Study:	7 semesters (3,5 year-long) full-time program
Credit points to be acquired:	210
The objectives of the training and the professional competencies to be acquired:	The objective(s) of the training is to train mechanical engineers who are able to operate and maintain machines and engineering equipments, to install and apply mechanical engineering technologies, to organize and control the work, and to fulfill the technical development, research and planning tasks of average complexity level in accordance with the requirements of the labour market; and who have acquired in-depth theoretical knowledge that is adequate to enable them to continue with their studies in the graduate, master level.
Prerequisites of specialization:	The fulfillment of the subject prerequisites of the subjects in relation to the specialization. In the 5th semester of the curriculum minimum one specialisation will be started. The precondition of starting other specialisations is that minimum 30 students must choose to study in each specialisation.

Practical internship:	The compulsory practical internship is included in the curriculum (in the 7th semester.).
Preconditions of the issue of college leaving certificate	The college leaving certificate certifies the successful completion of the exam requirements in accordance with the curriculum and the completion of the other study requirements (eg. physical education) and the collection of the required number of credit points defined in the study and output requirements (except the credit points related to the thesis). This certificate is a proof without qualification and evaluation that the student has fulfilled all the study and exam requirements defined in the curriculum.
Thesis:	The thesis research means the solution of a mechanical engineering problem or the elaboration of a research task on such a special field, on which it can be completed based on the knowledge acquired by the student during the years of his studies with the guidance of the first and second supervisor in one semester. The candidate proves with writing the thesis that he has adequate expertise in the practical use of the factual knowledge that he has learnt, and that he is able to do the tasks of a mechanical engineer and that he is familiar not only with the course material, but with the related special literature, as well, and he is able to apply that in a value-creating way. Formal requirements: the extent of the thesis must be 50 - 70 pages.
Prerequisites of final exam:	The prerequisites of the final exam are the receipt of the college leaving certificate and the thesis accepted for evaluation.
Final exam:	The final exam is to check and evaluate the professional knowledge, skills and abilities, which is required to grant the degree certificate. In the final exam the student must prove that he is able to apply the acquired knowledge in practice. The final exam includes defending the thesis and an oral exam of the subjects appointed in the curriculum. (FE1 and FE2).
Mechatronics Specialisation FE1 (final exam 1 complex) subjects:	DUEN(L)-MUG-158 Sensors and actuators DUEN(L)-MUG-114 Mechatronics systems 1. DUEN(L)-MUG-259 Electric drive technology
Mechatronics Specialisation FE2 (final exam 2 complex) subjects:	DUEN(L)-MUG-155 Base of Mechatronics DUEN(L)-MUG-258 Mechatronics systems 2. DUEN(L)-MUG-253 Automatic Control
Maintenance Specialisation FE1 (final exam 1 complex) subjects:	DUEN(L)-MUG-254 Maintenance Strategy DUEN(L)-MUG-112, 256 Maintenance technologies 1-2. DUEN(L)-MUG-118 Tribology
Maintenance Specialisation FE2 (final exam 2 complex) subjects:	DUEN(L)-MUG-151 Machinery DUN(L)-MUG-157, 219 Technical diagnostics 1-2.
Average of certificate:	The average of the certificate should be calculated in the following way: (FE + D + SA)/3. (FE) The mathematical average of the marks of the final exam subject(s). (D) The mark given by the final exam committee to the thesis. (SA) the weighed average mark of subjects for the total number of credit points collected in the complete study time period – except the credit points of thesis writing.
Qualification of certificate:	Excellent 4,51 - 5,00; Good 3,51 - 4,50; Satisfactory 2,51 - 3,50; Adequate 2,00 - 2,50
Precondition of the issue of certificate:	The precondition of the issue of certificate to prove the completion of higher educational studies is the successful final exam.
Language education:	English
Physical Education:	In every semester one lesson per week (only in the full-time course)
Study order:	Full-time course

Expected engineering competencies

a) knowledge

- Has a comprehensive knowledge of the basic facts, directions and boundaries of the subject of the technical field.
- Knows the general and specific mathematical, natural and social science principles, rules, connections and procedures necessary for the operation of the technical field.
- Knows the conceptual system, the most important contexts and theories related to his / her field.
- Comprehensive knowledge of knowledge acquisition and problem solving methods of the main theories of his / her field.
- Comprehensive knowledge of basic economic, business and legal rules and tools.
- Has an in-depth knowledge of the structural materials used in the field of mechanical engineering, the methods of their production and the conditions of their application.
- Basic knowledge of machine design principles and methods, machine building technology, control engineering procedures and operational processes.
- Has a comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices.
- Comprehensively knows the measurement procedures used in mechanical engineering, their tools, instruments and measuring equipment.
- Familiar with the expectations and requirements of the fields of work and fire protection, safety technology and occupational health required for his / her field of expertise, as well as the relevant regulations of environmental protection.
- Comprehensive knowledge of the basics of logistics, management, environmental protection, quality assurance, information technology, law, economics, their boundaries and requirements, which are integral to the field of mechanical engineering.
- Has an in-depth knowledge of the learning, knowledge acquisition and data collection methods of the field of mechanical engineering, their ethical limitations and problem-solving techniques.
- Knowledge of methods and tools for cost-benefit analysis in the corporate economy and on a technical basis.
- Can interpret, characterize and model the structural units of mechanical systems, the structure and operation of their elements, the design and connection of the applied system elements.
- Can apply the number of objectives, modeling principles and methods of mechanical product, process and technological design.

b) skills

- Is able to perform a basic analysis of the disciplines that make up the knowledge system of the technical field, to formulate the connections synthetically and to perform adequate evaluation activities.
- Is able to apply the most important terminologies, theories and procedures of the given technical field when performing the tasks related to them.
- Ability to plan, organize and perform independent learning.
- Ability to identify routine professional problems, to explore, formulate and solve (using practical operations in practice) the theoretical and practical background needed to solve them.
- Is able to understand and use the typical literature, computer and library resources of his / her field.
- Is able to apply the acquired IT knowledge in solving the tasks arising in his / her field.
- Ability to create basic models of technical systems and processes.
- Able to use his knowledge in a creative way to effectively manage the resources of his workplace.
- Able to apply and comply with safety, fire protection and hygiene rules and regulations in the course of his work.
- Ability to communicate orally and in writing in his / her mother tongue and at least one foreign language in a professionally adequate manner, in accordance with his / her field of expertise.
- Able to apply technical regulations related to the operation of mechanical systems, the principles of setting up and operating machines and mechanical equipment, and economic contexts.
- Ability to manage and control technological production processes, keeping in mind the elements of quality assurance and quality control.
- Able to diagnose mechanical failures, select remedial operations, solve repair technology tasks

c) attitude

- Undertakes and authentically represents the social role of its profession, its fundamental relationship with the world.
- Open to getting to know and accept professional, technological development and innovation in the technical field, and to mediate it authentically.
- Strives to make self-education a means of achieving its professional goals.
- Makes its decision in full compliance with legal and ethical standards, even in situations that require a complex approach or in unexpected decision-making situations.
- Strives to solve problems as much as possible in collaboration with others.
- Strives for its self-education in the field of mechanical engineering to be continuous and in line with its professional goals.
- Strives to solve its tasks and management decisions by getting to know the opinions of the supervised employees, preferably in cooperation.
- Has adequate endurance and monotony tolerance to perform practical activities.
- Open to the use of IT tools, seeks to learn and apply software belonging to the field of mechanical engineering, knows and manages at least one such program at a skill level.
- Open and receptive to the application of new, modern and innovative procedures and methods related to organic farming and health awareness.
- Applying the acquired technical knowledge, he strives to get to know the observable phenomena as thoroughly as possible, to describe and explain their laws.
- In the course of his work, observes and complies with the relevant safety, health protection, environmental protection and quality assurance and control requirements.

d) Autonomy and responsibility

- Even in unexpected decision-making situations, independently considers and develops comprehensive, fundamental professional issues on the basis of specific sources.
- Recognizes and represents the values of the engineering profession responsibly, openly accepts professionally grounded critical remarks.
- In the course of performing professional duties, he/she also cooperates with qualified specialists in other fields (primarily technical, as well as economic and legal).
- Identifies the shortcomings of the applied technologies, the risks of the processes and initiates the measures to reduce them.
- Monitors legislative, technical, technological and administrative changes in the field.
- On the basis of the instructions of his/her workplace manager, he/she manages the work of the assigned personnel, supervises the operation of the machines and equipment.
- Evaluates the efficiency, effectiveness and safety of the work of subordinates.
- Pays attention to the promotion of the professional development of its subordinates, to the management and assistance of their efforts in this direction, and to the application of the principle of equal access.
- Share your experiences with your co-workers, thus helping their development.
- Takes responsibility for the consequences of your technical analyzes, proposals based on them and decisions made.

Full-time course Mechanical Engineering, Bachelor program

CODES	Modules / Courses	Semesters - classes per week																																Prerequisites	Course responsible
		1					2					3					4					5					6					7					
		lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.		
DUEN-MUT-151	Engineering Physics	1	1	1	V	5																															Dr. Horváth Miklós
DUEN-ISR-010	Informatics	0	0	3	F	5																															Váraljai Mariann
DUEN -TVV-122	Enterpreneurship	1	2	0	F	5																															Dr. Kovács Tamás
DUEN-TKT-151	Economics I.	1	2	0	V	5																															Dr. Fogarasi József
DUEN-MUG-152	Mechanics I.	1	2	0	V	5																															Dr. Zachár András
DUEN-IMA-152	Engineering Mathematics 1.	0	3	0	V	5																															Dr. Jenei Árpád
DUEN-MUT-250	Thermodynamics and Hydrodynamics						1	1	1	V	5																									DUEN-IMA-152 DUEN-MUT-151	Dr. Kiss Endre
DUEN-MUG-212	CAD						0	0	3	F	5																											Dr. Vizi Gábor
DUEN-MUA-211	Chemistry and Materials Science						1	0	2	F	5																											Dr. Kovács Imre
DUEN-MUG-214	Machine Structures 1.						1	2	0	F	5																											Dr. Sánta Róbert
DUEN-MUG-257	Mechanics 2.						1	2	0	V	5																										DUEN-MUG-152	Dr. Zachár András
DUEN-IMA-212	Engineering Mathematics 2.						1	2	0	F	5																										DUEN-IMA-152	Dr. Buzáné dr. Kis Piroska
DUEN-TVV-114	Management											1	2	0	F	5																					Dr. Rajcsányi-Molnár Mónika
DUEN-IMA-110	Mathematics 3.											0	3	0	F	5																				DUEN-IMA-152	Dr. Nagy Bálint
DUEN-MUG-211	Introduction to the Mechatronics											2	0	1	F	5																				DUEN-MUT-151	Dr. Bajor Péter
DUEN-MUA-116	Technology of Structural Materials											1	0	2	F	5																				DUEN-MUA-211	Dr. Csepeli Zsolt
DUEN-MUG-110	Machine Structures 2.											2	1	0	F	5																				DUEN-MUG-152 DUEN-MUG-212 DUEN-MUG-214	Dr. Sánta Róbert
DUEN-MUG-153	Mechanics 3.											1	2	0	V	5																				DUEN-MUG-152	Dr. Sánta Róbert
DUEN-MUG-213	Metrology																2	0	1	F	5																DUEN-MUG-257 DUEN-IMA-110	Dr. Pór Gábor
DUEN-MUG-215	Machine Structures 3.																1	2	0	F	5																DUEN-MUG-214	Dr. Sánta Róbert
DUEN-MUA-210	Welding																1	1	1	F	5																	Dr. Palotás Béla
DUEN-MUG-252	Production engineering																2	1	0	V	5																DUEN-MUG-257 DUEN-MUG-110	Dr. Vizi Gábor
DUEN-MUG-210	Machinery in general																2	0	1	F	5																DUEN-MUT-250	Dr. habil. Szlivka Ferenc
	Elective subject studies																1	2	0	V	5																	
DUEN-MUG-151	Machinery																					2	1	0	V	5												DUEN-MUG-210	Dr. habil. Szlivka Ferenc
	A subject of specialisation (in semester 5.)																					8	3	1	V/F	20													
DUEN-ISR-117	Electric engines and drives																					2	1	0	V	5													Dr. Szabó István
DUEN-MUG-251	Machine Structures 4.																										2	1	0	V	5						DUEN-MUG-153 DUEN-MUG-215	Dr. Sánta Róbert
	A subject of specialisation (in semester 6.)																										6	2	4	V/F	20							
DUEN-MUG-253	Automatic Control																										1	2	0	V	5						DUEN-ISR-010 DUEN-IMA-110	Dr. Bajor Péter
DUEN-MUT-110	Environmental protection and energy management																															2	0	1	F	5		Dr. Kiss Endre
	Elective subject studies																															1	2	0	V/F	5		
DUEN-MUG-091	Thesis project																															0	9	0	A	15	fulfilling all of the subject semesters 1-6	Dr. habil. Szlivka Ferenc
DUEN-MUG-093	Professional Practice																															0	0	0	A	0		
DUEN-MUG-117	Quality Management																															2	1	0	F	5		Dr. Bajor Péter
Weekly		4	10	4		30	5	7	6		30	7	8	3		30	9	6	3		30	12	5	1		30	9	5	4		30	5	12	1		25		
Total number of classes per week		18					18					18					18					18					18					18						
Total number of credits		210																																			

Mechatronics Specialisation

CODES	Modules / Courses	Semesters - classes per week																																Prerequisites	Course responsible
		1					2					3					4					5					6					7					
		lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.		
DUEN-MUG-155	Basics of Mechatronics																					2	0	1	V	5										DUEN-MUG-211	Dr. Kővári Attila
DUEN-MUG-158	Sensors and Actuators																					2	0	1	V	5										DUEN-MUG-211	Dr. Nagy András
DUEN-MUG-114	Mechatronic systems 1.																					2	0	1	F	5										DUEN-MUG-211	Dr. Bajor Péter
DUEN-MUG-113	Mechatronic project 1.																					0	1	2	F	5										DUEN-MUG-211	Dr. Kővári Attila
DUEN-MUG-259	Electric drive technology																										2	1	0	V	5					DUEN-MUG-158 DUEN-ISR-117	Dr. Kővári Attila
DUEN-MUG-218	Mechatronics Systems Programming																										0	0	3	F	5					DUEN-MUG-155	Dr. Nagy András
DUEN-MUG-258	Mechatronic systems 2.																										2	0	1	V	5					DUEN-MUG-114	Dr. Nagy András
DUEN-MUG-217	Mechatronic project 2.																										0	1	2	F	5					DUEN-MUG-113	Dr. Kővári Attila
Weekly																						**6**	**1**	**5**		**20**	**4**	**2**	**6**		**20**						

Maintenance Specialisation

CODES	Modules / Courses	Semesters - classes per week																																Prerequisites	Course responsible
		1					2					3					4					5					6					7					
		lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.	lec.	pr.	lab.	req.	cr.		
DUEN-MUG-111	Production Planning, CAM																					2	0	1	F	5										DUEN-MUG-252	Dr. Vizi Gábor
DUEN-MUG-118	Tribology																					2	1	0	F	5										DUEN-MUT-250 DUEN-MUG-110	Dr. Szabó Attila
DUEN-MUG-157	Technical Diagnostics 1.																					2	1	0	V	5										DUEN-IMA-110 DUEN-MUG-153	Dr. Bajor Péter
DUEN-MUG-112	Maintenance Technologies 1.																					2	1	0	F	5										DUEN-MUG-252 DUEN-MUA-210	Dr. Szabó Attila
DUEN-MUG-256	Maintenance Technologies 2.																										2	1	0	V	5					DUEN-MUG-112	Dr. Szabó Attila
DUEN-MUG-219	Technical Diagnostics 2.																										2	0	1	F	5					DUEN-MUG-157 DUEN-MUG-151	Dr. Bajor Péter
DUEN-MUG-254	Maintenance Strategy																										2	1	0	V	5					DUEN-MUG-210 DUEN-MUG-251	Dr. Szabó Attila
DUEN-MUG-216	Complex machine design																										0	0	3	F	5						Dr. Vizi Gábor
Weekly																						**8**	**3**	**1**		**20**	**6**	**2**	**4**		**20**						

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Mérnöki Fizika</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="4">Engineering physics</td><td>Code</td><td>DUEN(L)-MUT-151</td></tr>
<tr><td colspan="2">Subject code</td><td colspan="6"></td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="6">-</td></tr>
<tr><td colspan="3">Number of Lessons</td><td colspan="3"></td><td rowspan="2">Requirements</td><td rowspan="2">Credits (ECTS)</td><td rowspan="2">Language of Education</td></tr>
<tr><td></td><td>Lecture</td><td>Seminar</td><td>Laboratory</td></tr>
<tr><td>Full-time</td><td>13</td><td>13</td><td>13</td><td>F (practical mark)</td><td>5</td><td>English</td></tr>
<tr><td>Correspondence</td><td>10</td><td>5</td><td>5</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td>Name</td><td colspan="3">Dr. Miklós Horváth</td><td>Position</td><td>professor</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">- To understand and learn the principles of particle mechanics, electricity, fluid and gas mechanics, thermodynamics, optics, quantumechanics,
- the preparation of the BSc level Physics and other related subjects</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td>Lecture</td><td colspan="5">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Seminar</td><td colspan="5">Flipchart, blackboard and other multimedia equipment, droup wor fir problem solving</td></tr>
<tr><td>Laboratory</td><td colspan="5">Labporatory excercises in the physics laboratory</td></tr>
<tr><td colspan="2" rowspan="4">Requirements</td><td colspan="6">Knowledge
– Gets acquainted with the principles of physics
– Gets practice for problem solving in physics problems
– Gets practice for measuring of basic physical quantities</td></tr>
<tr><td colspan="6">Ability
– Able to recognize the physical aspect of technical problems,
– Able to solve and calculate physical problems,
– Able to measure the physical parameters, able to use the instruments for measuring the basic physical patameteres</td></tr>
<tr><td colspan="6">Attitude
– He is open to learning about and accepting knowledge related to physics Interested in new methods and tools related to the field.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
Taking responsibility for one’s own work and the work of others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="6">Kinematics, axioms of mechanics, basic equation of dynamics, work, energy, power, linear momentum, and collisions, oscillatory motion, simple harmonic motion, damped oscillation, forced oscillation, resonance.
Basic phenomena of fluid dynamics, buoyant forces, Archimedes' principle, continuity equation, Bernoulli equation.
Thermodynamics, thermal expansion, work and heat, specific heat, latent heat, calorimetry, thermodynamic processes, First Law of thermodynamics, kinetic theory of gases, Second Law of thermodynamics, entropy and disorder, energy conservation.
Electricity electrostatics, electric current, resistance, Ohm's law, network analysis, magnetic field, electromagnetic induction, alternating current circuits.
Optics, geometric optics, propagation of light. Interference of light, single-slit diffraction, diffraction grating, photometry. Laboratory practices.</td></tr>
<tr><td colspan="2">Activity forms of students</td><td colspan="6">Individual work, frontal class work, problem solving. lab excercises in small groups</td></tr>
<tr><td colspan="2">Compulsory reading and its availability</td><td colspan="6">Materials on MOODLE
Alvin Halpern: Beginning Physics I-II
SHAUM OUTLINE SERIES McGraw- Hill, ISBN 0-07-025653-5)</td></tr>
<tr><td colspan="2">Recommended reading and its availability</td><td colspan="6">Daniel Oman- Robert Oman: Physics for the Utterly Confused (McGraw- Hill Companies, ISBN: 0-07-048262-4) Daniel Oman- Robert Oman: How to solve Physics Problems (McGraw- Hill Companies, ISBN: 0-07-048166-0)</td></tr>
<tr><td colspan="2">Hand-in Assignments/ measurement reports</td><td colspan="6">alltogether 5 measuring reports on the laboratory excercises</td></tr>
<tr><td colspan="2">Description of midterm tests</td><td colspan="6">Midterm tests on weeks 7th and 13th.</td></tr>
</table>

INFORMATICS

DUEN-ISR-010 0/0/4/F/5

Prerequisite: None
Learning outcomes and objectives: General-purpose IT knowledge. Acquiring essential basic skills for the forthcoming special IT subjects and for improve competences. **Contents:** IT basics (history of computer science, hardware, software, IBM PC). Computer architecture. Microsoft Windows operating system. Total Commander, creating archives (ARJ-RAR-ZIP, SFX, password protection). Microsoft Office. Word processing (Microsoft Word: basic commands, formatting text, creating tables and using built-in functions, inserting and creating pictures, graphics, using styles, creating macros, typography: the optimal line spacing, golden section, etc.). Spreadsheet (Microsoft Excel: basic commands, main functions, formatting, formulas, charts, filter, goal seek, solver, database). Computer database, Microsoft Access. PowerPoint. The Prezi software. Open Office. Creating PDF files. Using computers: data security, data protection, ergonomics, health care-electric shock protection, environmental protection. Social phenomena and processes. Software copyright. Telework. Universal service, universal provider. Future trends.

Compulsory reading and its availability:
1. PCs For Dummies Quick Reference, 4th Edition By Dan Gookin
ISBN: 978-0-470-11526-8
2. Microsoft Office 2003 For Dummies By Wallace Wang
ISBN: 978-0-7645-3860-5
3. Parhami, Behrooz: Computer Architecture ISBN 10: 019515455 019515455
ISBN 13: 9780195154559

Available at the Library of the College.

Recommended reading and its availability:
Microsoft Office Tutorial and examples (Internet).

ENTERPRENEURSHIP

DUEN-TVV-122 1/2/0/F/5
Prerequisites: None
Learning outcomes and objectives:
To enable the students to understand the process centred resource economy and its application in practice.
Contents:
Fields of realisation of the enterprises: the essence of marketing, its role, strategic and tactical issues. Human resource economy, material assets economy, logistics, financial and cost economy of the enterprises, information economy and innovation activities of the enterprises, and finally the position of the Hungarian enterprises in the European Union.

Compulsory reading and its availability:
Chris Mulhearn, Howard R. Vane and James Eden (2001): Economics for Business, Palgrave
Recommended reading and its availability:
Handouts from the lecturer

ECONOMICS I.

DUEN-TKT-151 1/2/0/V/5
Prerequisites: None
Learning outcomes and objectives: Fundamental goal is that students learn and acquire knowledge through the economic laws of motion economy, real social relationships and interactions of the main laws. The Economics I Course of micro-and macro-economic phenomena, relationships and the presentation of the economic approach to

understanding the forces driving the actions of the economic life orientation helps. This framework is intended to present general concepts in economics, the market economy is the result of operations by the analysis of economic processes and phenomena of macro-economic understanding of the underlying regularities. The course will prepare the foundation for the applied economics and literacy.

Contents: In economics as a science. Introduction to economic thinking. Macro-and microeconomics. Positive and normative economics approach. The subject of economics, basic concepts. Coordination mechanisms in the economy. The market and its basic concepts. The operation of the market and the price mechanism. The supply and demand. Demand and supply function / curve. The market balance. The elasticity of demand. Flexibility and revenue relationship. The mixed economic agents. The motivations of household, income and expenditures. The management of business organizations. Costs, revenue, and profitfogalmak. Market forms and market structures. Production factors and markets. External effects in the economy. The concept of national economic performance, the most important statistical indicators of. The concepts of economic growth, conditions for measurement. Economic development, sustainable growth. The concept and functions of money. The modern banking system and money supply. Financial markets and inflationary trends. The basic categories of labor. Labor market imbalances, unemployment. The state of the market economy. Governmental functions. The budget. Macro-economic trends affecting the state. The open economy and economic policy context. International finance and capital flows, balance of payments. Globalization, international trends and issues in the global economy.

Compulsory reading and its availability:

1.Mankiw, N. G.: Macroeconomics, now in its 7th edition, 2010. Worth Publishers. 2.Begg, D., S. Fischer and R. Dornbusch [2002]; Economics -7th Edition (McGraw-Hill)

3.Moffat, Mike: Online Microeconomics Textbook

Recommended reading and its availability:

Handouts from the lecturer

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian</td><td colspan="3">Mechanika 1.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-152</td></tr>
<tr><td>English:</td><td colspan="3">Mechanics 1.</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="4">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="3">-</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="2">Number of lessons per week</td><td colspan="2" rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td>Lecture</td><td>Seminar</td><td>Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week 1</td><td>Week 2</td><td>Week 0</td><td rowspan="2">semester grade</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term 5</td><td>Term 10</td><td>Term 0</td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td>name:</td><td colspan="2">Dr. Zachár András</td><td>position:</td><td>associate professor</td></tr>
<tr><td>Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="7">• Goal:
To introduce the basic concepts and methods of statics, mechanics of materials and the take them into the context of engineering sciences and applications. To enrich the knowledge of students with some part of engineering communication on technical expressions, engineering method od problem solution, standards, etc.
• Previous knowledge and following goals in the studies:
High school Mathematics and Physics are necessary to start the Mechanics 1 course. Basics of geometry, trigonometry, algebra and mechanics are a must.
The components of Mechanics 1. are the foundations of many latter subjects. Mechanics 2 and 3. use containts of Mechanics 1., directly. Other engineering subjects (e.g. Machine Structures, Theory of Machines, Metrology, etc.) also can not be learnt without the knowledge of Mechanics 1.</td></tr>
<tr><td rowspan="4">Typical lesson types</td><td colspan="2">Lecture:</td><td colspan="5">Lecture using projector.</td></tr>
<tr><td colspan="2">Seminar:</td><td colspan="5">Using projector and additional materials.</td></tr>
<tr><td colspan="2">Laboratory</td><td colspan="5">-</td></tr>
<tr><td colspan="2">Other:</td><td colspan="5">-</td></tr>
<tr><td>Requirements
(in learning outcomes)</td><td colspan="7">Knowledge
– Knows basic concepts and laws of Newtonian mechanics.
– Has basic knowledge statics of beams.
– Knows information and communication mechanical properties of engineering materials and the related experiments.
– Knows the basic concepts of material degradation and the strength of materials.

Ability
– to operate with vectors.
– to operate with force systems.
– to determine reaction forces of a beam.
– to construct beam diagrams and compile beam functions.
– to calculate mechanical stresses from pure and mixed internal forces and moments.
– to validate a beam for strength.

Attitude
– Seeks to contribute to the development of new methods and tools related to the technical field.
– Strives to develop the knowledge of both himself and his employees through continuous self- and further training.
– Strives to adhere to and adhere to the ethical principles of work and organizational culture.
– Strives to adhere to and adhere to quality requirements.
– Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability.

Autonomy and responsibility:</td></tr>
</table>

	– Able to solve engineering tasks independently. – Takes the initiative in solving technical problems. – Take responsibility for the sub-processes under your control. – Makes professional decisions independently in its field of operation. – Encourages its employees and subordinates to practice responsibly and ethically. – Acts independently and proactively when solving professional problems. – They are responsible for sustainability, occupational health and safety culture and environmental awareness.
Short description of subject content	Concept of force, system of forces, equilibrium. Resultant of system of forces (using a calculation or a construction). Elements of load-bearing structures: geometry, support, load and material models. Reaction forces, internal loading functions and beam diagrams. Properties of a cross section: centre of gravity, first and second order moment of a cross section. Concept of deformations, strains and the mechanical stresses. Tensile test diagram and the main material properties of mechanics. Basics of design: stress analysis of pure and complex load cases (tensile/compression, shearing, bending, torsion and combinations). Stress state and general Hooke's law. Concept equivalent stress.
Forms of student activity	Getting theoretical background with leading/own: 13 / 47 hours. Getting practice in problem solution with leading/own: 26 / 94 hours.
Compulsory literature	1. F.P. Beer, E.R. Johnston, E.R. Eisenberg: Vector Mechanics for Engi-neers ? Statics, McGraw Hill, New York, USA, 2004 2. F.P. Beer, E.R. Johnston, J.T. DeWolf: Mechanics of Materials, McGraw Hill, New York, USA, 2004
Optional literature	1. R.C. Hibbeler: Engineering Mechanics – Statics, Pearson, 2016 2. R.C. Hibblere: Mechanics of Materials, Pearson, 2014
Compulsory tasks during semester	1. Week 6: Static analysis of a beam max. 20 points 2. Week 12: Design of a bendid beam structure max. 20 points
Midterm tests and their timing	Week 7: Practical test from the topic of statics of beams
Requirements of grade	To get the right for examination: ***1.*** Visit the minimum 70% of lectures ***2.*** Visit the minimum 80%of practices ***3.*** Minimum 25% success of midterm practical test The examination: The exam contains theorectical and practical parts. Students can earn ~30 points and ~70 points solving them. The total number of points is equal with the sum of homeworks points (max. 40 points) and the exam points (max. 80 points). The result of the subject, based on the rules of the university: 0-50 points: failed, 51-60 points: pass 61-70 points: medium 71-80 points: good 81- points: excellent

ENGINEERING MATHEMATICS 1.

DUEN-IMA-152 **1/5/0/V/5**

Prerequisite: None

Contents:

Set theoretical background. Functions of one variable. Basic properties of functions of one variable. Limits of functions and sequences. Differential calculus of functions of one variable. Differentiation rules. Mean value theorems. Applications of derivatives. Integral calculus of functions of one variable. The definite integral. The indefinite integral and its properties. Basic properties of functions of several variables. Differential calculus of functions of several variables.

Forms of student activity:

Directed learning of theoretical material 10 % Independent learning of theoretical material 30 % Directed exercise solving 30 % Independent exercise solving 30 %

Compulsory reading and its availability:

Talata, I.: A Guide to Mathematical Analysis, Dunaújváros, 2007, pp. 1-79. Electronic Study Guide.

Recommended reading and its availability:

Finney, R. L. ; Thomas, G. B.: Calculus, Addison-Wesley, New York, 1990.

<table>
<tr><td rowspan="2">Title of subject:</td><td>magyarul:</td><td colspan="3">Hő- és áramlástan</td><td colspan="3" rowspan="2">Code: DFAN-MUT-250</td></tr>
<tr><td>angolul:</td><td colspan="3">Heat and Fluid Dynamics</td></tr>
<tr><td colspan="2">Responsible chair:</td><td colspan="5">Chair of Natural Sciences and Environmental Protection</td></tr>
<tr><td colspan="2">Prerequivisits:</td><td colspan="3">Engineering Physics</td><td colspan="3">Code: DFAN-MUT-151</td></tr>
<tr><td rowspan="2">Type</td><td colspan="3">Weekly load</td><td rowspan="2">Requivirenment</td><td rowspan="2">Credit</td><td colspan="2" rowspan="2">Language of education</td></tr>
<tr><td>Lecture</td><td>Problem solving</td><td>Laboratory practice</td></tr>
<tr><td>Full time 150/52</td><td>1 per week</td><td>1 per week</td><td>1 per week</td><td rowspan="2">V</td><td rowspan="2">5</td><td colspan="2" rowspan="2">English</td></tr>
<tr><td>Part time 150/17</td><td>5 per semester</td><td>5 per semester</td><td>5 per semester</td></tr>
<tr><td colspan="2" rowspan="3">Responsible teacher</td><td>Name:</td><td colspan="2">Dr. Endre Kiss</td><td>:</td><td colspan="2">Professor</td></tr>
<tr><td>Tel:</td><td colspan="2">06 / 25 / 551 - 635</td><td>e-mail:</td><td colspan="2">kisse@uniduna.hu</td></tr>
<tr><td>Address:</td><td colspan="5">DF Műszaki Intézet, M ép. 20 szoba</td></tr>
<tr><td colspan="2" rowspan="3">Study types</td><td>Lecture:</td><td colspan="5">For every students, in a lecture theater, using projector</td></tr>
<tr><td>Practicet:</td><td colspan="5">For every students, problem solving</td></tr>
<tr><td>Laboratory practice:</td><td colspan="5">In pairs, measurements in laboratory</td></tr>
<tr><td colspan="2">Purpose</td><td colspan="6">The study of the practical problems solution</td></tr>
<tr><td colspan="2">Short content</td><td colspan="6">The basics of fluid dynamics and thermodynamics. Euler and Bernoully equations, Haagen-Poiseuille equations, viscosity, laminar and turbulent flow, pressure drag in turbulent flow. Pressure drop in fittings. Impulse theorem. Similarity. Solid body in viscous substance. Intensive and extensive quantities. Uneversal and unified gas law. The mechanical work and the heat, and the firstlaw of thermodynamics. Isochoric, isobaric, isotherm and adiabatic processes. The politropic process. Cycles. Otto and Diesel cycles. Enthalpy, entropy, the second law of thermodynamics. Real gases. Thermal energy transport, conductance. convection and radiation. Heat pump and refrigerator.</td></tr>
<tr><td colspan="2">Compulsory literature</td><td colspan="6">– Kiss E. Heat and Fluid Dynamics Electronic notes (Moodle)
– Kiss E. Heat and Fluid Dynamics Problem solving Electronic notes (Moodle)
– Kiss E. Laboratory syllabuses Electronic notes (Moodle)</td></tr>
<tr><td colspan="2">Description of tasks</td><td colspan="6">The student have to prepaire a prereport according to the syllabuses before laboratory practices. After the measurements the student must provide a laboratory report, which is evaluated, and if is evaluated 1, it must be repeated.</td></tr>
<tr><td colspan="2">Tests</td><td colspan="6">There are two tests during the semester. the first is in the 7th, and the second in the 13th week. The test is consisting of 10 freechoise questions (max. 30 points), two assay questions (max 20 points), and two problems tos olve for 50 points. If the results of the two test is as an average lower than 51 points, the semester is not successful. There are chances to repeat the tests.</td></tr>
</table>

CAD

DUEN-MUG-212 **0/0/3/F/5**

Prerequisites: None

Learning outcomes and objectives:

To make the students familiar with the practice of computer aided geometrical modelling through the use of a modern, parametrical modelling system (SolidWorks). Building parametrical models of machine parts. Making assemblies and generating documentation for manufacturing.

Contents: Features of parametric modelling systems. Basic concepts. Parametric geometric models, associativity, features as building blocks, sketches, geometric relations etc. Prerequisites of running the program, initial steps, screen areas. Contracting basic features. Adding and removing material.

Features demanding a sketch. Features not demanding a sketch. Creating protrusion, cut, chamfer, fillet and shell. Creating a revolution solid. Sweep and loft. Geometrical relations in sketches. The application of equations to fulfil the designer's intentions. Linking dimensions. Creating configurations and part families. Creating assemblies. The Top-Down technique. Generating drawings from parts. Creating views, sections, detail views. Generating drawings from assemblies. Creating bills of material automatically.

Compulsory reading and its availability: SolidWorks Online Help

Recommended reading and its availability: Descriptions and documentations related to SolidWorks.

The name of subject	magyarul	**Kémia és Anyagismeret**					Level	A	
	in English	**CHEMISTRY AND MATERIALS SCIENCE**						DUEN-MUA-211	
Responsible department		Materials Science Department							
Prerequisites:		None							
Types	Number of lectures per semester:					Requirement	Credit	Language of education	
	Lectures		Problem solving		Labs				
		2		2		0	V	5	english
Responsible teacher:		Name		Dr. Kovács Imre			occupation	associate professor	
Educational objectives:		**Learning objectives:** The objective of the subject is that the students get elementary knowledge of chemistry, to come to know the structure of the materials and the electron shell that determines the material properties, to learn about the chemical bondings that determine the macroscopic characteristics and to learn the microscopic structure and the test methods of different type materials (metals, ceramics and polymers).							
Methods of delivery:		Lectures	presentation						
		Problem solving							
		Labor	Practice in Lab with chemical samples and equipments						
Educational objectives:		The students learn the relationships between the structure and the properties of materials and based on it in some simple cases they will be able to select the appropriate material for the given application.							
Short description of this course:		Atomic structure. The periodic(al) system of elements. Electronic configuration. The types and characteristics of the chemical bonds. Electron affinity, electron negativity, oxidation number. Strong bonds. Weak bonds. General characterisation of metals and their activity. Elementary knowledge of organic chemistry. Grouping of carbon compounds. nomenclature. Isomerism. The most important reactions of organic materials. Linking of macromolecules as the base of polymer production. Elementary silicate chemistry. Fundamentals of colloid chemistry. Solid state transformations. Polymorph transformations. The types of the engineering materials. Interaction of structure, processing and properties. Crystal structure, crystal systems. Crystal, crystallite. Crystal defects. Atom movement in the material, diffusion. The phases and structural constituents of metallic materials. The importance of the equilibrium phase diagrams and their determination. The reading rules of binary and ternary phase diagrams. The types of the binary phase diagrams.							
Students Activity:		Understanding and assimilation of the topics of presentations 50% Testing of materials 30% Laboratory excercises 20%							
Compulsory reading:		[1] Clifford C. Houk, Richard Post: Chemistry: Concepts and Problems: A Self-Teaching Guide, 2nd Edition, 1996, Wiley [2] William D. Callister: Materials Science and Engineering, An Introduction, 2007, Wiley Recommended reading and its availability:[3] ASM Metals Handbook Desk Edition 2001; [4] **Chemistry, Seventh Edition** S.S. Zumdahl, S. A. Zumdahl; **Houghton Mifflin Company** Boston New York,2007							

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian</td><td colspan="4">Gépszerkezettan 1.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-214</td></tr>
<tr><td>English:</td><td colspan="4">Machine structures 1.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="2">Institute:</td><td colspan="6">University of Dunaújváros</td></tr>
<tr><td colspan="2">Compulsory pre-subject:</td><td colspan="4">-</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="2">Number of lessons per week</td><td colspan="2" rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td>Lecture</td><td>Seminar</td><td>Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week 1</td><td>Week 2</td><td>Week 0</td><td rowspan="2">F</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term 5</td><td>Term 10</td><td>Term 0</td></tr>
<tr><td colspan="2">Teacher responsible for the subject</td><td colspan="2">name: 1</td><td colspan="2">Dr. Robert Santa</td><td>position:</td><td>associate professor</td></tr>
<tr><td colspan="2">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="6">To make the students familiar with the basics of technical descriptions and to develop spatial sense and sense of form and the skills of reading technical drawings. To make the students familiar with the rules and prescriptions of the engineering technical descriptions, and with the aspects of selection of standard machine parts. To make the students familiar with the most popular machine parts.</td></tr>
<tr><td colspan="2" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="5">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Seminar:</td><td colspan="5">Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work</td></tr>
<tr><td>Laboratory</td><td colspan="5">-</td></tr>
<tr><td>Other:</td><td colspan="5">-</td></tr>
<tr><td colspan="2">Requirements
(in learning outcomes)</td><td colspan="6">Knowledge
– Knows in detail the rules for preparing technical documentation. - Knows the organizational tools and methods related to management, the legislation of the field required for the practice of the profession.
– Knows information and communication technologies related to mechanical engineering.
– Knows the conceptual system, the most important connections and theories related to his field.
– Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of the field.

Ability
– Able to master the global design of complex systems based on a systems-based, process-oriented mindset.
– Ability to complexly plan and manage the use of technical, economic, environmental and human resources.
– Able to apply and further develop procedures, models, information technologies used in the design, organization and operation of mechanical systems and processes.
Attitude
– Seeks to contribute to the development of new methods and tools related to the technical field.
– Strives to develop the knowledge of both himself and his employees through continuous self- and further training.
– Strives to adhere to and adhere to the ethical principles of work and organizational culture.
– Strives to adhere to and adhere to quality requirements.
– Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability.

Autonomy and responsibility:
– Able to solve engineering tasks independently.
– Takes the initiative in solving technical problems.
– Take responsibility for the sub-processes under your control.
– Makes professional decisions independently in its field of operation.
– Encourages its employees and subordinates to practice responsibly and ethically.
– Acts independently and proactively when solving professional problems.</td></tr>
</table>

	– They are responsible for sustainability, occupational health and safety culture and environmental awareness.
Short description of subject content	Plane of projection, coordinate system, projection. Description of point. Real size view and point view of a line. Law of projection and view change. Mutual position of spatial elements. Projections of a line depending on its position, crossing and skew lines. Transversal lines, special lines of a plane. Real size of a planar shape, constructions with rotation. Intersection of two planes, angles, distances. Regular solids. Solving problems by basic constructions. Basic standards of technical drawings. Theoretical survey of projection systems in the engineering practice. Using views and view systems. Using sections and segments. Dimensioning on technical drawings. Dimensional networks. Description of threaded parts. Rules on making assembly drawings, numbering systems. The most common machine parts, the description conventions of the most common machine parts. Autonomous use of standards and constructional aids, drafting and construction of drawing of components. Construction of simple structural units without strength analysis.
Forms of student activity	- Understanding and assimilation of the topics of presentations 30% Drafting practice 35% Homeworks 35%
Compulsory literature	- Materials on MOODLE
Optional literature	- Robert L. Norton: Machne Design - An Integrated Approach, 2006, Pearson Prentice Hall Upper Saddle River NJ. - Franz Koenigsberger, Machine tool structure,ISBN 10: 008013405X
Compulsory tasks during semester	- 8 homework’s.
Midterm tests and their timing	- 2 tests, 6 and 12 weeks, 8 homework’s.

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian</td><td colspan="3">Mechanika 2.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-257</td></tr>
<tr><td>English:</td><td colspan="3">Mechanics 2.</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="4">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="3">-</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="4">Number of lessons per week</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Seminar</td><td colspan="2">Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week</td><td>1</td><td>Week</td><td>2</td><td>Week</td><td>0</td><td rowspan="2">semester grade</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term</td><td>5</td><td>Term</td><td>10</td><td>Term</td><td>0</td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td>name:</td><td colspan="2">Dr. Zachár András</td><td>position:</td><td>professor</td></tr>
<tr><td>Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="6">• Goals:
Application of the concepts and relations, heard at the lectures, at the practice helps to the student to learn the basics of design methods of complex load bearing structures. Meets with the statics of structures and the topic of design limits of structure.
• Previous knowledge and following goals in the studies:
In Mechanics 2 course the students learn about the generalisation of topics of Statics and Mechanics of Materials what were introduced in Mechanics 1. These knowledge is going to extended with the topics of Dynamics in Mechanics and is going to applied on many fields of engineering subjects (e.g. Machine Structures, Theory of Machines, Metrology, etc.)</td></tr>
<tr><td rowspan="4">Typical lesson types</td><td colspan="2">Lecture:</td><td colspan="4">Lecture using projector.</td></tr>
<tr><td colspan="2">Seminar:</td><td colspan="4">Using projector and additional materials.</td></tr>
<tr><td colspan="2">Laboratory</td><td colspan="4">-</td></tr>
<tr><td colspan="2">Other:</td><td colspan="4">-</td></tr>
<tr><td>Requirements
(in learning outcomes)</td><td colspan="6">Knowledge
– Knows the most common types of load bearing structures.
– Has knowledge of design limits of structures
– Knows rules and standards of validation and design of structures.
Ability
– Able to overview a mechanical problem of a load bearing structure.
– Ability to classify the structure and determine the mechanical properties of the structure (e.g. reaction forces, internal forces, stress field, factor of safety, etc.).
– Able to combine and apply different fields of science (mathematics, mechanics, physics) in order to observe and understand the behavior of a structure.
– Ability to choose and apply the engineering standards to validate or design a load bearing structure.

Attitude
– Seeks to contribute to the development of new methods and tools related to the technical field.
– Strives to develop the knowledge of both himself and his employees through continuous self- and further training.
– Strives to adhere to and adhere to the ethical principles of work and organizational culture.
– Strives to adhere to and adhere to quality requirements.
– Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability.

Autonomy and responsibility:
– Able to solve engineering tasks independently.
– Takes the initiative in solving technical problems.
– Take responsibility for the sub-processes under your control.
– Makes professional decisions independently in its field of operation.</td></tr>
</table>

	– Encourages its employees and subordinates to practice responsibly and ethically. – Acts independently and proactively when solving professional problems. – They are responsible for sustainability, occupational health and safety culture and environmental awareness.
Short description of subject content	Statics of Structure: Classification of structures. Statics of multi-hinge beams, frames and truss structures. Calculation and construction of reaction forces. The internal forces in structures. Application of mobile structures: rope and rod-chains. Applied Mechanics of Materials: Limits of mechanical design: stiffness, stability, ductility, durability. Engineering methods of validation for these limits. Work theorems of mechanics and their applications to calculate deformations. Application of works thorems on staticaly undetermined structures. The bifurcation and stabilty analysis of finite DOF systems and continuums. Buckling of slendre compressed beams. The basics of fracture mechanics. Introduction to the phenomena of fatigue crack.
Forms of student activity	Getting theoretical background with leading/own: 13 / 47 hours. Getting practice in problem solution with leading/own: 26 / 94 hours.
Compulsory literature	1. F.P. Beer, E.R. Johnston, E.R. Eisenberg: Vector Mechanics for Engi-neers ? Statics, McGraw Hill, New York, USA, 2004 2. F.P. Beer, E.R. Johnston, J.T. DeWolf: Mechanics of Materials, McGraw Hill, New York, USA, 2004
Optional literature	3. R.C. Hibbeler: Engineering Mechanics – Statics, Pearson, 2016 4. R.C. Hibblere: Mechanics of Materials, Pearson, 2014
Compulsory tasks during semester	1. Week 3: Reaction forces and beam diagrams of a frame max. 10 points 2. Week 6: Internal forces of a truss structure max. 10 points 3. Week 9: Experimental strain analysis max. 10 points 4. Week 12: Problem of a staticaly undetermined structure max. 10 points
Midterm tests and their timing	Week 7: Practical test from the topic of statics of structures
Requirements of grade	To get the right for examination: ***4.*** Visit the minimum 70% of lectures ***5.*** Visit the minimum 80%of practices ***6.*** Minimum 25% success of midterm practical test The examination: The exam contains theorectical and practical parts. Students can earn ~30 points and ~70 points solving them. The total number of points is equal with the sum of homeworks points (max. 40 points) and the exam points (max. 80 points). The result of the subject, based on the rules of the university: 0-50 points: failed, 51-60 points: pass 61-70 points: medium 71-80 points: good 81- points: excellent

ENGINEERING MATHEMATICS 2.

DUEN-IMA-212 **1/4/0/F/5**

Prerequisites: DUEN-IMA-152

Teaching objectives: A mathematical theory is introduced to solve quantitative problems in technical and other fields. Methods of problem solving in the course topics are introduced and ability for students to use these methods is developed.

Content: Vectors, operations with vectors. Matrices, operations with matrices. Determinant, inverse and rank of a matrix. Systems of linear equations. Lines and planes in space, distances. Combinatorics. Sample space and events, basic event operations. The probability of an event. Axioms of probability. Computing the probability of an event. Conditional probability. Multiplication law of probabilities. Independent events. Theorem of full probability. Bayes' Theorem. Independent trials. Random variables and their characteristics. Markov's inequality, Chebyshev's inequality. Notable probability distributions. The week law of large numbers. The Central Limit Theorem. Basic notions in statistics. Samples. Numerical and graphic characterization of data sets. Calculation of sample mean, sample standard deviation, sample modus, sample median, sample quartiles and other characteristics. Inferences about a population. Theory of estimaton. Point estimation and estimation by confidence interval for the poulation mean, for standard deviation and for a proportion. Statistical hypotheses. Basic concepts of testing hypotheses, type I error, type II error. Notable probability distributions at the tests. Parametric tests for the mean and for the standard deviation. Nonparametric tests. The bases of correlation and regression analysis.

Compulsory reading and its availability:

Ross, Sheldon: A First Course in Probability, Pearson Education Inc.,ISBN 0-13-201817-9 Bhattacharyya, Gouri K.; Johnson, Richard A.: Statistical Concepts and Methods, John Wiley & Sons, ISBN 0-471-07204-4
Nicholson, W. Keith: Linear algebra with applications, (Fifth Edition) McGraw-Hill Ryerson,
ISBN 0-07-092277-2

MANAGEMENT

DUEN-TKT-114 **1/3/0/F/5**

Prerequisite: None

Learning objective: To enable the students to learn, analyse and develop the management and decision making systems of work organizations, and to effectively organize the individual and group work.

Contents: Interpretation and origin of management. The importance of management in the governance of companies. Process management. Definitions of the organization. Organization types and attributes. Management techniques. Leadership. Presentation techniques. Time management. Rational decisions. Communication and negotiation techniques. Personal marketing. Management of the organisational culture. Networking. The manager and creativity. Teamwork. **Compulsory reading and its availability:**

1.Naylor J (1999) Management London Financial Times Publishing

2.Mullins L. J. (1999) Management and Organisational Behaviour, London, FT Pitman

Recommended reading and its availability:

1. BPP (1996) Organisational Behaviour London BPP

2.Handouts from the lecturer

MATHEMATICS 3.

DUEN-IMA-110 **1/3/0/F/5**

Prerequisites: DUEN-IMA-152

Teaching objectives: A mathematical theory is introduced to solve quantitative problems in technical and other fields. Methods of problem solving in the course topics are introduced and abilities for students to use these methods are developed.

Content: Special differentiation rules. Geometric application of derivatives. Area. Volumes and surfaces of revolution. Length of a curve. Centre of gravity. Multiple integration. Numerical integration. Solving nonlinear equations. Separable differential equations. Variable transformation: ax+by+c. Variable transformation: y/x. First order linear differential equations. Second order linear differential equations. Missing variable in second order differential equations.

Compulsory reading and its availability:

Talata, I.: A Guide to Mathematical Analysis, Dunaújváros, 2007, pp. 1-79. Electronic Study Guide.

Recommended reading and its availability:

Finney, R. L. ; Thomas, G. B.: Calculus, Addison-Wesley, New York, 1990.

TECHNOLOGY OF STRUCTURAL MATERIALS

DUEN-MUA-116 **2/0/2/F/5**

Prerequisites: DUEN-MUA-211

Learning objectives: The aim is that the students be able to select the materials and production technologies that are the most suitable for a given objective. The students learn the manufacturing, properties, application and property modification technologies (alloying, melting, plastic deformation, heat treatment, surface treatment), melting and forming technologies of the most important metallic and non-metallic structural materials. The students learn most important welding technologies and their application. **Contents:** Phase diagrams. The Fe-Fe3C equilibrium phase diagram. Phase transformations. Steel production. Basic oxygen steelmaking. Electric arc furnace. Continuous casting. Steel processing. Hot rolling. Cold rolling. Forging. Casting. Heat treatment of steels. Mechanical properties. Strengthening mechanisms. Steel applications Sustainability (steel and the environment, principles of life cycle thinking). Aluminum production and processing. Properties of aluminum. Heat treatment of aluminum. Case studies for the industrial application of aluminum. **Forms of student activity:**

Understanding and assimilation of the topics of presentations 50% Testing of materials 30%
Laboratory excercises 20%

Compulsory reading and its availability:

1. William D. Callister: Materials Science and Engineering, An Introduction, 2007, Wiley
2. www.steeluniversity.com
3. www.alumatter.info

Recommended reading and its availability:

4. ASM Metals Handbook Desk Edition 2001
5. ASM Metals Handbook Volume 14 - Forming And Forging
6. core.materials.ac.uk

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian</td><td colspan="4">Gépszerkezettan 2.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-110</td></tr>
<tr><td>English:</td><td colspan="4">Machine structures 2.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="2">Institute:</td><td colspan="6">University of Dunaújváros</td></tr>
<tr><td colspan="2">Compulsory pre-subject:</td><td colspan="4">DUE(L)-MUG-152
DUEN(L)-MUG-212
DUEN(L)-MUG-214</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="4">Number of lessons per week</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Seminar</td><td colspan="2">Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week</td><td>2</td><td>Week</td><td>1</td><td>Week</td><td>0</td><td rowspan="2">F</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term</td><td>10</td><td>Term</td><td>5</td><td>Term</td><td>0</td></tr>
<tr><td colspan="2">Teacher responsible for the subject</td><td>name:</td><td colspan="3">Dr. Robert Santa</td><td>position:</td><td colspan="2">associate professor</td></tr>
<tr><td colspan="2">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="6">To make the students familiar with the typical constructions of the mechanical equipment’s, and with the conditions of selecting, dimensioning and operating them. Teaching the thinking style and problem solving methods of engineering practice through relatively simple projects, based on previously obtained knowledge in mechanics, technical description and CAD.</td></tr>
<tr><td colspan="2" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="5">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Seminar:</td><td colspan="5">Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work</td></tr>
<tr><td>Laboratory</td><td colspan="5">-</td></tr>
<tr><td>Other:</td><td colspan="5">-</td></tr>
<tr><td colspan="2">Requirements
(in learning outcomes)</td><td colspan="6">Knowledge
– Knows in detail the rules for preparing technical documentation. - Knows the organizational tools and methods related to management, the legislation of the field required for the practice of the profession.
– Comprehensive knowledge of the basic facts, directions and boundaries of the subject of the technical field.
– Knows information and communication technologies related to mechanical engineering.
– Basically knows the principles and methods of machine design, machine building technology, control procedures and operating processes.
– Can apply the related calculation and modeling principles and methods of mechanical product, process and technology design

Ability
– Able to master the global design of complex systems based on a systems-based, process-oriented mindset.
– Ability to complexly plan and manage the use of technical, economic, environmental and human resources.
– Able to apply and further develop procedures, models, information technologies used in the design, organization and operation of mechanical systems and processes.
Attitude
– Seeks to contribute to the development of new methods and tools related to the technical field.
– Strives to develop the knowledge of both himself and his employees through continuous self- and further training.
– Strives to adhere to and adhere to the ethical principles of work and organizational culture.
– Strives to adhere to and adhere to quality requirements.
– Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability.

Autonomy and responsibility:
– Able to solve engineering tasks independently.
– Takes the initiative in solving technical problems.
– Take responsibility for the sub-processes under your control.
– Makes professional decisions independently in its field of operation.
– Encourages its employees and subordinates to practice responsibly and ethically.</td></tr>
</table>

	– Acts independently and proactively when solving professional problems. – They are responsible for sustainability, occupational health and safety culture and environmental awareness.
Short description of subject content	Repeatedly occuring parts and units of engineering equipment's with similar structure and shape - machine parts. Definition, classification, description, mechanical dimensioning, correct setup, operation and amintenance of machine parts. The machine parts to be discussed in detail: fixing and actuating screws, shafts and axles, shaft-hub joints, couplings, bearings, belt and chain drives, gears. During the exposition of the subject the emphasis is mainly put on the description and the general review of the machine parts.
Forms of student activity	- activity: Guided procession of the theoretical curriculum 20 % Autonomuous procession of the theoretical curriculum 20 % Guided solution of problems 20 % Autonomuous solution of problems 40 % Guided laboratory tests - Creating laboratory reports.
Compulsory literature	- Materials on MOODLE
Optional literature	- Robert L. Norton: Machne Design - An Integrated Approach, 2006, Pearson Prentice Hall Upper Saddle River NJ. - Franz Koenigsberger, Machine tool structure,ISBN 10: 008013405X
Compulsory tasks during semester	- 1 homework
Midterm tests and their timing	- 2 tests, 6 and 12 weeks, 1 homework.

<table>
<tr><td colspan="2" rowspan="2">Title of subject:</td><td>Hungarian</td><td colspan="3">Mechanika 3.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-153</td></tr>
<tr><td>English:</td><td colspan="3">Mechanics 3.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="5">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="3">DUEN-MUG-152</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="2" rowspan="2">Number of lessons per week</td><td colspan="2">Seminar</td><td>Practice/Laboratory</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td>Lecture</td><td>Seminar</td><td>Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week</td><td>1</td><td>Week</td><td>2</td><td>Week</td><td>0</td><td rowspan="2">V</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term</td><td>5</td><td>Term</td><td>10</td><td>Term</td><td>0</td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td>name:</td><td colspan="3">Dr. Robert Santa</td><td>position:</td><td>associate professor</td></tr>
<tr><td colspan="3">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="5">The students become initiated into the definition of the kinematic and kinetic characteristics of the material points, the rigid bodies and the simple mechanisms. The students get to know the classification and the working of the mechanisms frequently occuring in the mechanical engineering practical tasks. They acquire knowledge about the collision and swinging phenomenon of the flexible bodies.</td></tr>
<tr><td colspan="3" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="5">Lecture using projector.</td></tr>
<tr><td>Seminar:</td><td colspan="5">Using projector and additional materials.</td></tr>
<tr><td>Laboratory</td><td colspan="5">-</td></tr>
<tr><td>Other:</td><td colspan="5">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="5">Knowledge
– Knows the general and specific mathematical, natural and social science principles, necessities, connections and treatments that need to be cultivated in the technical field.
– Knows the main conceptual system, the most important contexts and theories according to the field.
– Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of his / her field.
Ability
– Able to master the global design of complex systems based on a systems-based, process-oriented mindset.
– Ability to complexly plan and manage the use of technical, economic, environmental and human resources.
– Able to apply and further develop procedures, models, information technologies used in the design, organization and operation of mechanical systems and processes.
Attitude
– He is open to learning about and accepting knowledge related to mechanics related to his / her qualification or field. Interested in new methods and tools related to the field.
Autonomy and responsibility:
– Taking responsibility for one’s own work and the work of others</td></tr>
<tr><td colspan="3">Short description of subject content</td><td colspan="5">The moment of movement, the angular momentum, the kinetic energy of the material point and the performance of the strength and momentum. Kinetic theorems. The definition of the rigid body. Its kinds of movement, elementary movements. The speed condition of the rigid body, speed diagram. The acceleration of the rigid body, acceleration diagram. The moment of movement of rigid bodies, its angular momentum and kinetic energy. The kinetic theorems in relation to the rigid bodies. The rolling of the rigid bodies and its rotatory motion on a fixed axis. The static and dynamic balancing. The kinetics of structures with classis and reduction method. The collision of the rigid bodies. The definition, the characteristics, the classification, the structure and the kinematic examination of the mechanisms. Types of drives (cog-wheel-drive, belt-drive, friction gear and chain-drive).</td></tr>
<tr><td colspan="3">Forms of student activity</td><td colspan="5">- Processing of the theoretical study material in a self-dependant way/ with tutoring: 15/35 % Task Solving in a self-dependant way/ with tutoring: 20/29 % Laboratory measurements with tutoring: 1 %</td></tr>
</table>

Compulsory literature	- Materials on MOODLE
Optional literature	- Robert L. Norton: Machne Design - An Integrated Approach, 2006, Pearson Prentice Hall Upper Saddle River NJ. - Franz Koenigsberger, Machine tool structure,ISBN 10: 008013405X
Compulsory tasks during semester	- 2 homework's.
Midterm tests and their timing	-

METROLOGY

DUEN-MUG-213 **2/0/1/F/5**

Prerequisites: DUEN-MUG-257, DUEN-IMA-110

Learning outcomes and objectives:

By the end of the modul time period the students must be familiar with the basic terminology of the measuring techniques, the definitions used in the domestic and international bibliography. The students must know every tool of the mechanical measuring, they should be able to do the basic measurings in practice and the evaluation of the measuring results. The student should be able to plan the experiment from the theoretical preparational and from the measuring technical aspect, too. The student should be able to plan and evaluate the exercises of simple force, extension and tension measuring on mechanical and civil engineering structures.

- The student is expected to be familiar with the definition and calculation of the measuring uncertainity, the calculation of dispersion, the estimation of measuring uncertainity at serial measurings and a priori data.

Contents:

The mechanical tools of the direct linear dimensioning. The mechanical tools of the relative linear dimensioning. Optical linear dimensioning instruments. Gauge blocks. Coordinate measuring instrument. Angular measurement. Extension and strength measuring. The operation principle, the main sources of errors and the application techniques of the dynamometer, extensometer and the dislocation-meter. Mechanical examinations, the application possibilities of the stressing examinations. Processing of measuring results with statistical methods. The estimation of measuring results.

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian</td><td colspan="3">Gépszerkezettan 3.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-215</td></tr>
<tr><td>English:</td><td colspan="3">Machine structures 3.</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="2">Institute:</td><td colspan="5">University of Dunaújváros</td></tr>
<tr><td colspan="2">Compulsory pre-subject:</td><td colspan="3">DUEN -214</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="2">Number of lessons per week</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td>Lecture</td><td>Seminar</td><td>Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week 1</td><td>Week 2</td><td>Week 0</td><td>F</td><td>5</td><td>English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term 5</td><td>Term 10</td><td>Term 0</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Teacher responsible for the subject</td><td>name:</td><td colspan="2">Dr. Robert Santa</td><td>position:</td><td>associate professor</td></tr>
<tr><td colspan="2">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="5">The student must learn how to solve those descriptive geometrical kind of problems that can arise in the mechanical engineering design and construction work. He must be
familiar with the elementary construction methods needed to solve various, complex tasks and to determine their order. Out of the possible solution methods he must be able to choose the one which is the optimal one in the specific situation. The student must be able to do the self-dependant adaptation of the basic design methods by the use of
segmentation and transformation with the plane sections of simple geometrical surfaces, interpenetration and projective transformation occuring in the mechanical engineering
practical work. The student must be familiar with creating complex forms occuring in the mechanical engineering practical work, with the design of surfaces with line movement with the description of surfaces that can be spread-out on a plane.
The student must be familiar with the self-dependant use of standards and design aids and the design of machine units and parts. The student must learn the theoretical
structure of the ISO tolerance system and the system of fits for the correct definition of the dimension deviations,. tolerances and fits. The student must acquire the knowledge
of the index numbers concerning the surface quality of the machine parts, and he must be able to define them. He must be able to design the machine parts to be made in
accordance with a specific production technology. The students must study how to reconstruct the technical drawing of machine parts, so that the part or its substitutional part could be manufactured on the basis of the ready-made drawing.</td></tr>
<tr><td colspan="2" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="4">Lecture using projector.</td></tr>
<tr><td>Seminar:</td><td colspan="4">Using projector and additional materials.</td></tr>
<tr><td>Laboratory</td><td colspan="4">-</td></tr>
<tr><td>Other:</td><td colspan="4">-</td></tr>
<tr><td colspan="2">Requirements
(in learning outcomes)</td><td colspan="5">Knowledge
– Knows in detail the rules for preparing technical documentation. - Knows the organizational tools and methods related to management, the legislation of the field required for the practice of the profession.
– Knows information and communication technologies related to mechanical engineering.
Ability
– Able to master the global design of complex systems based on a systems-based, process-oriented mindset.
– Ability to complexly plan and manage the use of technical, economic, environmental and human resources.
– Able to apply and further develop procedures, models, information technologies used in the design, organization and operation of mechanical systems and processes.

Attitude
– Seeks to contribute to the development of new methods and tools related to the technical field.
– Strives to develop the knowledge of both himself and his employees through continuous self- and further training.</td></tr>
</table>

	– Strives to adhere to and adhere to the ethical principles of work and organizational culture. – Strives to adhere to and adhere to quality requirements. – Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability. **Autonomy and responsibility:** – Able to solve engineering tasks independently. – Takes the initiative in solving technical problems. – Take responsibility for the sub-processes under your control. – Makes professional decisions independently in its field of operation. – Encourages its employees and subordinates to practice responsibly and ethically. – Acts independently and proactively when solving professional problems. – They are responsible for sustainability, occupational health and safety culture and environmental awareness.
Short description of subject content	The typical surfaces and bodies of the mechanical engineering practical work. The plane section of the plane-surfaced bodies. The plane section of the curvilinear bodies. The interpenetration of the plane-surfaced bodies. The interpenetration of the curvilinear bodies. The ISO toleration system. The tolerations of the linear dimensions. Fits. The index numbers of surface quality and the method of their definition. The specific design of the cast-, welded and chipped parts. The reconstruction of machine parts (reverse engineering).
Forms of student activity	- Processing of the theoretical study material with tutoring: 20 % - Processing of the theoretical study material in a self-dependant way: 20 % - Task Solving with tutoring: 20 % - Task Solving in a self-dependant way: 40 %
Compulsory literature	- Materials on MOODLE
Optional literature	- Robert L. Norton: Machne Design - An Integrated Approach, 2006, Pearson Prentice Hall Upper Saddle River NJ. - Franz Koenigsberger, Machine tool structure,ISBN 10: 008013405X
Compulsory tasks during semester	- 3 homework’s
Midterm tests and their timing	- 2 tests, 6 and 12 weeks, 3 homework’s.

PRODUCTION ENGINEERING

DUEN-MUG-252 **2/2/1/V/5**

Prerequisites: DUEN-MUG-257, DUEN-MUG-110

Learning objectives:

The students shall learn the basics of production technology. Cutting: the students shall learn the basics of cutting and its results. Knowledge of the basic cutting processes. Calculation and selection of the technological data. Calculation of machine time and standard time norm and determination of costs. Knowledge of other cutting processes.

Contents:

Cutting processes. Type and features of cutting. Technologies of turning, planing, boring, milling, grinding. Calculation of allowances, feeds, speeds, number of cycles in case of every process. Calculation of machining time and cost analysis. Unconvencial cutting processes, sawing, broaching, threading, gearing. EDM technologies. Determination of stock. Calculation of dimensional chain.

Forms of student activity:

Assimilation of the theoretical material with assistance: 5 % Assimilation of the theoretical material without assistance: 40 % Problem solving with assistance: 15 % Problem solving without assistance: 40 %

Compulsory reading and its availability:

1. Manufacturing Technology, (Manufacturing processes) R.K.RAJPUT LAXMI PUBLICATIONS (P) LTD 113, Golden House, Daryaganj, New Delhi-110002, EMT-0750-350-ATB OF MANUFACTURING TECH
2. Production Technology, HMT Bangalore, Tata McGraw-Hill Education, 2001, ISBN-13: 978-0-07-096443-3, ISBN-10: 0-07-096443-2
3. Production engineering, K.C. Jain, A. K. Chitale, 2010, PHI learning Private Limited, New Delhi, ISBN-978-81-203-3526-4

Recommended reading and its availability: Recommended literature:
Manufacturing process-I, H.S.Bawa, 2004, Tata McGraw-Hill Publishing Company Limited, second reprint 2006. ISBN 0-07-053525-6

ELECTRICITY

DUEN-ISR-256 **2/2/1/F/5**

Prerequisites:

Learning outcomes and objectives:

The goal of the subject is to form the proper approach of IT students and material science and mechanical engineering students in the field of electrical circuits and electronics. The following relevant concepts are clarified: electric charge, electric force, current, voltage, energy, power, reference directions, ideal devices. Students will learn the basic physical laws and computational methods of electrical phenomena concerning field theory and circuit theory, learn about the basic structures of passive and active devices, their operating principles and applications. This way a basic knowledge for acquiring the later subjects associated with electronic hardware is obtained.

Contents:

Basic concepts: charge, force, current, voltage, reference directions, energy, power, passive components and sources. DC networks: Ohm's law, Kirchhoffs laws, resistor networks, the loop current method, the nodal potential method, superposition, homogeneity. Transient phenomena: first order networks, second order networks. AC circuit analysis: phasors, impedance and admittance, power, Kirchhoff's laws, impedance transformations, the loop current method, the nodal potential method, one port and two port networks. Semiconductors physics: conductance, chrystal structure, silicon as a semiconductor, silicon doping. The PN junction: without bias, positive bias, negative bias, breakdown, models, operating point, applications. Bipolar transistors: structures, operating modes, features, amplifiers. The MOS transistor: operating principles, modeling, amplifiers.

Forms of student activity:

Processing of the theoretical study material: 35 %
Clarifying information by computational problem solving 35%.
Autonomous problem solving 30%.

Recommended reading and its availability:

Giorgio Rizzoni: Principles and Applications of Electrical Engineering, McGraw-Hill, 2005.

<table>
<tr><td rowspan="2">Name of the subject</td><td>HUNGARIAN</td><td colspan="4">Általános géptan</td><td>Level</td><td>A</td></tr>
<tr><td>English</td><td colspan="4">Machinery in general</td><td></td><td>DUEN(L)-MUG-210</td></tr>
<tr><td colspan="2">Responsible Education Unit</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Mandatory pre-study name</td><td colspan="6">DUEN(L)-MUT-250
Heat and Flow
Dynamics</td></tr>
<tr><td rowspan="2">Type</td><td colspan="5">Hours per week</td><td rowspan="2">Requirement</td><td rowspan="2">Credits</td><td rowspan="2">Language of education</td></tr>
<tr><td colspan="2">Performance</td><td colspan="2">Practice</td><td colspan="2">Lab</td></tr>
<tr><td>All-time</td><td></td><td>2</td><td>0</td><td>1</td><td rowspan="2">Practice note</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Correspondence</td><td>Semiannual</td><td>10</td><td>Semiannual</td><td>0</td><td>Semiannual</td><td>5</td></tr>
<tr><td colspan="2">Subject Officer</td><td colspan="3">Name</td><td colspan="2">Dr. habil. Ferenc Szlivka</td><td>Status</td><td>Professor</td></tr>
<tr><td colspan="2">Training purpose and justification of the course (content, output, curriculum space)</td><td colspan="6">Goals, development objectives
o He is fully familiar with the basic facts, directions and boundaries of the field of technical expertise.
o You are familiar with the concept system in your field, the most important contexts and theories.
o He is fully familiar with the operational principles and structural components of the work and power equipment, mechanical equipment, equipment and equipment used.
o Interpret, characterize and model the structure and operation of the structural units and components of mechanical systems, the design and connection of the constituents used.</td></tr>
<tr><td colspan="2" rowspan="4">Typical transfer methods</td><td colspan="3">Performance</td><td colspan="3">For all the students in high-performance, board performance. Projector, use (67% of total hours)(26 hours)</td></tr>
<tr><td colspan="3">Practice</td><td colspan="3"></td></tr>
<tr><td colspan="3">Lab</td><td colspan="3">Manual editing practice in groups of up to 30 people. (33% of total hours) (1 p.m.)</td></tr>
<tr><td colspan="3">Other</td><td colspan="3"></td></tr>
<tr><td colspan="2" rowspan="4">Requirements (expressed in academic results)</td><td colspan="6">Knowledge
o He is fully familiar with the basic facts, directions and boundaries of the field of technical expertise.
o You are familiar with the concept system in your field, the most important contexts and theories.
o He is fully familiar with the methods of acquiring knowledge and problem solving the main theories of his field.
o He is fully familiar with the operational principles and structural components of the work and power equipment, mechanical equipment, equipment and equipment used.
o Interpret, characterize and model the structure and operation of the structural units and components of mechanical systems, the design and connection of the constituents used.</td></tr>
<tr><td colspan="6">Ability
o Students must have a basic mechanical approach after hearing the subject. The basic operation and energy processes of machinery must be known and well applied in practice.
o Students must be able to draw a hydraulic wiring diagram after completing the course.
o Students acquire proficiency in pneumatic propulsion technology, as well as plc applications and programming.</td></tr>
<tr><td colspan="6">Attitude
It is open to the knowledge and accommodating of mechanical engineering problems related to his qualifications and field of expertise. Interested in new methods and tools for mechanical pneumatic and hydraulics.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
Taking responsibility for his own work and the work of his peers.</td></tr>
<tr><td colspan="2">A brief description of the content of a subject</td><td colspan="6">o General mechanical engineering. Types of physical quantities used in mechanical engineering, specifying, applying, recalculations. Measurement systems. Conversion between different measurement systems.
o Characteristics of the smooth operation of machinery. Loss of power transmission, efficiency of machinery, variable speed operation, start-up, shutdown. Hydraulics: Hydraulic power supplies.
o Pumps and motors, hydraulic cylinders. Proportional pressure limiters, pressure reducers, current perverts.
o Pipes, pipe joints, batteries, filters. Switching technology. Pneumatic shoots characteristics, areas of application. Pneumatic elements. Basic connections. Presentation and identification of items. Pneumatic elements, application examples.</td></tr>
</table>

Student activities	o Processing of theoretical material by control 30 % Self-processing of theoretical material 25 % o Task solving with management 10 % Self-processing of tasks 12 % o Performance material 2 pieces. o Laboratory measurements under direction 10% Preparation of laboratory reports 13% o Two pieces. TEST
Mandatory literature and availability	-MOODLE General machinery PPT presentations - Attila Kovács: General Mechanical Engineering (university note) University Publishing House, Bp. 1999. 263 old. - Zobory I. - Szabó A.: General Mechanical Engineering (university note) Art University Publishing House, Bp. 1998. 83, 2015, in New York. Pneumatics -Kjell Evensen-Jul Ruud : Basics of Pneumatics, MECMAN EGER Kft. Budapest 1994., -FESTO: Introduction to pneumatics P111. Festo Ltd. 2001. -FluidSIM simulation software on the institutional network Hydraulics -Mannesmann-Rexroth Gmbh: What you need to know about hydraulics 1. Volume Number: RU 00301/4.82
Recommended literature and availability	- Imre Dolgos: Machine plant ing I. - National Textbook Publisher, 1998. Budapest - Keeltytyús Á. Géza: Machine planting - Technical Publisher, 1983. Budapest

<table>
<tr><td colspan="2" rowspan="2">Name of the subject</td><td>HUNGARIAN</td><td colspan="5">Géptan</td><td>Level</td><td>A</td></tr>
<tr><td>English</td><td colspan="5">Machinery</td><td></td><td>DUEN(L)-MUG-151</td></tr>
<tr><td colspan="2">Responsible Education Unit</td><td colspan="7">Institute of Engineering</td></tr>
<tr><td colspan="2">Mandatory pre-study name</td><td colspan="7">DUEN(L)-MUG-210
General mechanical engineering</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="5">Hours per week</td><td rowspan="2">Requirement</td><td rowspan="2">Credits</td><td rowspan="2">Language of education</td></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Practice</td><td>Lab</td></tr>
<tr><td>All-time</td><td></td><td></td><td>2</td><td></td><td>1</td><td></td><td rowspan="2">Examination</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Correspondence</td><td></td><td>Semester</td><td>10</td><td>Semester</td><td>5</td><td>Semester</td></tr>
<tr><td colspan="2">Subject Officer</td><td colspan="3">Name</td><td colspan="2">Dr. habil. Ferenc Szlivka</td><td>Status</td><td colspan="2">Professor</td></tr>
<tr><td colspan="2">Training purpose and justification of the course (content, output, curriculum space)</td><td colspan="8">Goals, development objectives
o He is fully familiar with the basic facts, directions and boundaries of the field of technical expertise.
o You are familiar with the concept system in your field, the most important contexts and theories.
o He is fully familiar with the operational principles and structural components of the work and power equipment, mechanical equipment, equipment and equipment used.
o Interpret, characterize and model the structure and operation of the structural units and components of mechanical systems, the design and connection of the constituents used.</td></tr>
<tr><td colspan="2" rowspan="4">Typical transfer methods</td><td colspan="3">Lecture</td><td colspan="5">For all the students in high-performance, board performance. Projector, use (67% of total hours)(26 hours)</td></tr>
<tr><td colspan="3">Practice</td><td colspan="5">Manual editing practice in groups of up to 30 people. (28% of total hours) (10 a.m.)</td></tr>
<tr><td colspan="3">Lab</td><td colspan="5">(5% of all hours 3 hours demonstration lab</td></tr>
<tr><td colspan="3">Other</td><td colspan="5"></td></tr>
<tr><td colspan="2" rowspan="4">Requirements (expressed in academic results)</td><td colspan="8">Knowledge
o You are familiar with the concept system in your field, the most important contexts and theories.
o He is fully familiar with the methods of acquiring knowledge and problem solving the main theories of his field.
o You are fundamentally familiar with machine design principles and methods, mechanical engineering, control technology processes and operational processes.
o He is fully familiar with the operational principles and structural components of the work and power equipment, mechanical equipment, equipment and equipment used.
o Interpret, characterize and model the structure and operation of the structural units and components of mechanical systems, the design and connection of the constituents used.
o Apply the related calculation, modelling principles and methods of mechanical product, process and technological design.</td></tr>
<tr><td colspan="8">Ability
o Performs a job appropriate to your qualifications.
o Capable of designing, organising and performing self-study.
o Capable of producing a particular machine unit or a component capable of replacing it on the basis of the finished drawing.</td></tr>
<tr><td colspan="8">Attitude
It is open to knowledge and knowledge of mechanical equipment related to his qualifications and field. Get an inquisitive look at new techniques and tools related to your field.</td></tr>
<tr><td colspan="8">Autonomy and responsibility
Taking responsibility for his own work and the work of his peers.</td></tr>
<tr><td colspan="2">A brief description of the content of a subject</td><td colspan="8">The subject primarily gives mechanical engineering students a knowledge that can be directly used in practice. After completing the course, students must be able to select flow and caloric machines from the catalogue (pumps, fans, internal combustion engines, compressors, etc.). For the operation and maintenance of existing equipment in the industry. Knowledge of the structure of the machines makes it suitable for students to renovate and modernise existing machinery equipment, to develop the knowledge obtained, even to create new equipment and procedures</td></tr>
<tr><td colspan="2">Student activities</td><td colspan="8">Processing of theoretical material by control 30 % Independent processing of theoretical material 25 %
Task resolution with management 10 % Self-processing tasks 12 %
Laboratory measurements under direction 10% Preparation of laboratory reports 13%
Two pieces. TEST</td></tr>
<tr><td colspan="2">Mandatory literature and availability</td><td colspan="8">- MOODLE Szlivka Ferenc PPT electronic curriculum DUE
- Ferenc Szlivka: Flow Machines note, Dunaújváros College 2008</td></tr>
</table>

	- Imre Dolgos: Planting machines II. National Textbook Publisher, 1998. Budapest
Recommended literature and availability	- Imre Dolgos: Planting of Machinery I. National Textbook Publisher, 1998. Budapest - Patytyús A. Géza: Machine planting. Technical Publisher, 1983. Budapest - Oliver Willy: Flow technology machines and systems. Textbook publisher, 1991. Budapest - József Gruber:: Fans. Technical Publisher, 1978. Budapest - Caloric machines - Gábor Bassa: Burning in Flow, Textbook Publisher, 1986. Budapest

ELECTRIC ENGINES AND DRIVES

DUEN-ISR-117 **2/1/1/F/5**

Prerequisites: DFAN-MUG-081,

Learning outcomes and objectives:

The student should acquire the basic knowledge of the electric machinery. He gets to know the operation and the working characteristics of the electric machines that are used in the practical engineering work, and he will be able choose, operate and maintain the electric machines needed for various functions.

Contents:

The basics of electric machines. The structure and operation of transformers. The fundamentals of the operation of electric engines: physical bases, structure, losses and warming. The structure and the operation of the synchronous machines and three-phased asynchronous engines. The basics of operation, structure and operational conditions of the direct-current machines. Special engines: one-phased asynchronous engine, stepper motor.

Forms of student activity:

Processing of the study materials of the lessons bymaking notes: 60% Information systematization through tasks: 30% Self-dependant solving of tasks: 10%

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian</td><td colspan="5">Gépszerkezettan 4.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-251</td></tr>
<tr><td>English:</td><td colspan="5">Machine structures 4.</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="6">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="5">DUEN-MUG-153, DUEN-MUG-215</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="4">Number of lessons per week</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td colspan="2" rowspan="2">Language of teaching</td></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Seminar</td><td>Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week</td><td>2</td><td>Week</td><td>1</td><td>Week</td><td>0</td><td rowspan="2">V</td><td rowspan="2">5</td><td colspan="2" rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term</td><td>10</td><td>Term</td><td>5</td><td>Term</td><td>0</td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td>name:</td><td colspan="3">Dr. Robert Santa</td><td>position:</td><td colspan="2">associate professor</td></tr>
<tr><td colspan="3">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="6">The student should get to know the typical machine parts, machine rigs, the structure and the operation of the machine parts, machine units. The student should be able to design such units. He should be able to make the drawing documentation of the units with computer aids. The student is going to be able to apply what he has already learnt in Machine Structures II and Mechanics II. Subjects to design and create complex constructions.</td></tr>
<tr><td colspan="3" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="5">Lecture using projector.</td></tr>
<tr><td>Seminar:</td><td colspan="5">Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work</td></tr>
<tr><td>Laboratory</td><td colspan="5">-</td></tr>
<tr><td>Other:</td><td colspan="5">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="6">Knowledge
– Knows in detail the rules for preparing technical documentation. - Knows the organizational tools and methods related to management, the legislation of the field required for the practice of the profession.
– Knows information and communication technologies related to mechanical engineering.
– Knows the conceptual system, the most important connections and theories related to his / her field.
– Basically knows the principles and methods of machine design, machine building technology, control procedures and operating processes.
– Comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices.
Ability
– Ability to complexly plan and manage the use of technical, economic, environmental and human resources.
– Able to apply and further develop procedures, models, information technologies used in the design, organization and operation of mechanical systems and processes
– Ability to plan, organize and perform independent learning.
– Able to identify routine professional problems, explore and formulate the theoretical and practical background needed to solve them, and solve them.
– Ability to create basic models of technical systems and processes.
– Identifies, explores and formulates the theoretical and practical background needed to solve routine professional problems, solves them by applying practical operations.
Attitude
– Seeks to contribute to the development of new methods and tools related to the technical field.
– Strives to develop the knowledge of both himself and his employees through continuous self- and further training.
– Strives to adhere to and adhere to the ethical principles of work and organizational culture.
– Strives to adhere to and adhere to quality requirements.
– Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability.
Autonomy and responsibility:
– Able to solve engineering tasks independently.
– Takes the initiative in solving technical problems.
– Take responsibility for the sub-processes under your control.</td></tr>
</table>

	– Makes professional decisions independently in its field of operation. – Encourages its employees and subordinates to practice responsibly and ethically. – Acts independently and proactively when solving professional problems. – They are responsible for sustainability, occupational health and safety culture and environmental awareness.
Short description of subject content	The design of complex machine structures: static dimensioning, correct structural design, its operation and maintenance. The study material of the subject, besides other topics being important in the mechanical engineering work that have not been reviewed in the lessons of other subjects, is focused primarily on the drive techniques. Flexible (bend) drives, cluches, cog-wheel drives, springs, brakes, tubes and tubular structures, sealings.
Forms of student activity	- Processing of the theoretical study material with tutoring: 20 % - Processing of the theoretical study material in a self-dependant way: 20 %. Task Solving with tutoring: 20 %. Task Solving in a self-dependant way: 40 %
Compulsory literature	- Materials on MOODLE
Optional literature	- Robert L. Norton: Machne Design - An Integrated Approach, 2006, Pearson Prentice Hall Upper Saddle River NJ. - Franz Koenigsberger, Machine tool structure,ISBN 10: 008013405X
Compulsory tasks during semester	- 2 homework's.
Midterm tests and their timing	-

AUTOMATIC CONTROL

DUEN-MUG-253 **2/1/1/V/5**

Prerequisites: DUEN-MUG-211, DUEN-MUG-11

Learning outcomes and objectives:

The subject provides information to the students about the essential elements of control and regulation techniques, the most significant part of process control with special attention to the process regulations, production automatization. It is also the goal of the subject to establish PLC programming competecies in the students.

Contents:

The fundamental conceptions of control engineering. Control, regulation and their characteristics, its quality and types. Signs and systems, descriptive characteristics, effect-draft. The methodology of system description. Mapping, modelling and simulation.

Characteristic curve, temporary function, transfer function, weight function. The definition of resultive transfer function. Deterministic examining marks. Static and dynamic optimisation. Fourier and Laplace transformation. Frequency function. The Nyquist and Bode diagrams of typical parts. Stability criteria, compensation, trouble-shooting. The characteristics of Fuzzy regulation. The essential steps of PLC programming, step and ladder programming. SCADA systems.

ENVIRONMENTAL PROTECTION AND ENERGY MANAGEMENT

DUEN-MUT-110 **2/2/1/F/5**

Prerequisites:

Learning outcomes and objectives:

Students will get acquainted with the basic principles and general issues of environmental protection, the technologies of abatement and the elimination of pollutants.

Contents:

Basics of ecology. The purpose and fundamental issues of environment protection. The biological and geological environment. Cycles. The athmosphere. The most important pollutants of air. The properties of dust pollution in the air. The general properties of dust collection. Settling chambers and collectors with flow direction transformation. Cyclones. Basics of bag filters. Operating and cleaning of bag filters. Introduction of electrostatic precipitators. Bag filters with electrostatic charging and their possibilities of applications. Electrostatic precipitation with pulse energisation, abatement and decomposition of gases. Absorption and absorption processes. Scrabbers. Oxidation methods. Burning technologies. Odor abatement. The measurement of air pollution. The properties of natural waters and their pollution, self cleaning. Water treatment technologies and their equipments. The pollution of soil. Waste and waste treatment. Noise and vibration as environmental pollution. Radioactive pollution. Basics of energy management. Renewable energies.

Compulsory reading and its availability:

1. Ecology and Environmental Protection, selected chapters (on O drive)
2. Environmental Science Toward a Sustainable Future Richard T. Write, Bernard J. Nebel, Prentice Hall

Recommended reading and its availability:

3. The Biosphere, Ian Bradbury, Belhaven Press
4. Air Pollution, Its Origin and Control, Kenneth Wark and Cecil F. Warner, Harper and Row
5. Hazardous Waste Management Michael D. LaGrega, McGraw Hill
6. Drinking Water Quality, N.F. Gray, Wiley

PROFESSIONAL PRACTICE

DUEN-MUG-093 **0/0/0/A/0**

Prerequisite: Completion of all the study requirements in the first 6 semesters.

Learning outcomes and objectives:

The students should be able to plan their work; make the
necessary steps and analyse their results; finish tasks by the deadline; recognise and solve the problems of working organisations; professionally apply the information of the lectures; effectively communicate with experts; carry out tasks in individual and team work; make a report of the practical activity/thesis writing; report on their work; make written and oral
23
feedbacks supported by presentations in an economist style; explore and repair the problems arising during the work.

Contents: Professional application of the information acquired, achieving a complex economist and manager view.

Name of the subject	HUNGARIAN	**Szakdolgozat**						Level	A	
	English	**BSc Thesis**							**DUEN(L)-MUG-091**	
Responsible Education Unit		Institute of Engineering								
Mandatory pre-study name		1-6 semesters for all subjects								
Type	Hours per week							Requirement	Credits	Language of education
	Performance		Practice		Lab					
All-time				9				Signature	15	English
Correspondence	Semester		Semester	45	Semester					
Subject Officer	Name				Dr. habil. Ferenc Szlivka			Status	Professor	

Training purpose and justification of the course (content, output, curriculum space)	**Goals, development objectives** Work based on independent literature processing and data collection, as well as individual consultation, which uses what is learned during the training and the information collected during the traineeship.	
Typical transfer methods	Performance	
	Practice	The student prepares his thesis independently in 100% of the practice during individual consultations.
	Lab	
	Other	
Requirements (expressed in academic results)	**Knowledge** o The student shall summa the knowledge acquired during the course and the results of the traineeship, and as a synthesis of his studies, he will prepare a thesis on the selected subject in the field of computer engineering inter contaminant with information technology and electronics. A thesis is an independent work requiring the creative use of the acquired knowledge. The thesis is managed and assisted by a consultant. The thesis is at least 50 pages long, up to 80 pages.	
	Ability o The student should be able to solve problems arising from mechanical engineering work based on what they have learned. Recognize the elementary edits needed to solve complex tasks, and be able to determine the order in which they are. o You can choose the optimal solution from the possible solutions for your situation. Be able to train and visualize complex forms in mechanical practice. o The student should be proficient in using standards and editing aids on their own, sketching and editing part drawings, and editing machine units. The student should know the theoretical structure of the ISO tolerance and fitting system for the correct specification of allowable dimensional deviations, tolerances and fittings. Be able to specify the accuracy requirements for machine parts. Know the metrics characterizing the surface quality of machine parts, be able to determine and prescribe them. o Be able to design machine parts with a specific design for a given manufacturing technology. Be able to reconstruct the technical drawing of real machine parts so that the given part or a part that can replace it can be manufactured on the basis of the completed drawing. o Be able to understand, analyze and make suggestions for improving industrial process problems (eg maintenance problems). o Be able to properly present and document problems and their solutions.	
	Attitude He is open to learning about and accepting engineering knowledge related to his qualifications and field of expertise. Interested in new methods and tools related to the field. And he is able to incorporate them into the dissertation being prepared.	
	Autonomy and responsibility Taking responsibility for applying your own work and technical standards	
Short description of the course content	Summarizing the knowledge acquired during the training and the results of the professional practice, the student prepares a dissertation on the selected topic in the field of mechanical engineering integrated with informatics and electronics as a synthesis of his studies. The dissertation is an independent work that requires the creative use of the acquired knowledge. The preparation of the dissertation is assisted by the regular guidance and guidance of the consultants	
Mandatory literature and availability	Literature recommended by the industry and university consultant	

QUALITY MANAGEMENT

DUEN-MUG-117 **2/1/0/F/5**

Prerequisite: None.

Learning outcomes and objectives:

Students will be able to interpret the fundamental concepts of quality management, review the main areas of quality management, analyse the different interpretation of quality and development of quality, analyse of deviation of conformity. Students will be able to interpret the connections of participants in the productions and services in the point of view of quality and formulate the tasks of Quality Management in a structure and present the set-up of quality - house. Students shall know the structure of national quality system and they shall know the philosophy of TQM and its effects on quality managements, on employees and on environment.

Students shall know the aims and requirements of quality awards and roles of standards, their system of national and international standardisation and their roles in the quality policy of European Union.

Students will be able to interpret standards and analyse of their text. They will know the requirement of quality management system standard.

Students shall be practised in the using of Quality Management System, in the Environment Management System and in Occupational Health and Safety Advisory Services standards and they can apply the methods and technics of quality management and European System of conformity-audition management.

Contents:

The subject gives a general review of professional relations of building and operation of Quality Management System and about that the building of a quality management system is a process approached. In the build-up of Quality Management System they take into consideration the law background and documentation requirements of system and technics helping of quality improvement. Subject shows the main elements of ISO 9000 system and different awards of quality and completing of subject the Environment Management System and in Occupational Health and Safety Advisory Services will be also introduced shortly.

Compulsory reading and its availability:

G. Vorley - F. Tickle: Quality Management - Principles & Practice QM& Training Limited,
Guildford, UK ISBN 1 904302 02 5

MECHATRONICS SPECIALISATION

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian:</td><td colspan="4">Mechatronika alapjai</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-155</td></tr>
<tr><td>English:</td><td colspan="4">Basics of mechatronics</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="5">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="3">-</td><td>Code:</td><td>-</td></tr>
<tr><td rowspan="2">Type</td><td colspan="2" rowspan="2">Number of lessons per week</td><td colspan="2">Seminar</td><td colspan="2">Practice/Laboratory</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td colspan="2">Lecture</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week</td><td>2</td><td>Week</td><td>0</td><td>Week</td><td>1</td><td rowspan="2">semester grade</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term</td><td>10</td><td>Term</td><td>0</td><td>Term</td><td>1</td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td>name:</td><td colspan="3">Dr. Attila Kővári</td><td>position:</td><td>associate professor</td></tr>
<tr><td colspan="3">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="5"></td></tr>
<tr><td colspan="3" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="4">Lecture with a projector or online course materials (note, lecture student, other), guides to learn or online consultations.</td></tr>
<tr><td>Seminar:</td><td colspan="4">-</td></tr>
<tr><td>Laboratory</td><td colspan="4">Laboratory tasks can be performed by contact or with the help of online laboratory tasks and guides, supplemented by online consultations.</td></tr>
<tr><td>Other:</td><td colspan="4">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="5">Knowledge
Comprehensive knowledge of the basic facts, directions and boundaries of the field of mechatronics.
Knows the general and specific rules, contexts and procedures required for cultivating the field of mechatronics.
Knows the conceptual system, the most important connections and theories related to the field of expertise.
Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of this field.
Familiar with the measurement procedures used in mechanical engineering, their tools, instruments and measuring equipment at the application level.
Ability
Able to plan, organize and conduct independent learning.
Able to identify routine professional problems, to solve them in principle and to explore, formulate and solve a practical background.
Able to understand and use the typical literature, computer technology and library resources of the field.
Attitude
Aware of the importance of technical activity.
Committed to implementing modern technical applications.
Autonomy and responsibility
Able to develop and implement engineering processes and tools.</td></tr>
<tr><td colspan="3">Short description of subject content</td><td colspan="5">Structure and modeling of mechatronic systems. Mechanical foundations of mechatronics, passive and active system elements. The most important electricity converters used in mechatronic systems. Mechatronic components, motion transducers..</td></tr>
<tr><td colspan="3">Forms of student activity</td><td colspan="5">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="3">Compulsory literature</td><td colspan="5">Materials in moodle system.</td></tr>
<tr><td colspan="3">Optional literature</td><td colspan="5">BISHOP, Robert H. The Mechatronics Handbook-2 Volume Set. CRC press, 2002.</td></tr>
<tr><td colspan="3">Compulsory tasks during semester</td><td colspan="5">defined on the first lesson</td></tr>
<tr><td colspan="3">Midterm tests and their timing</td><td colspan="5">2 tests as given in the first lecture, retake in the following week, semester evaluation in the last week.</td></tr>
</table>

Subject name	In Hungarian	**Szenzorok és aktuátorok**							Level	A	
	In English	**SENSORS AND ACTUATORS**							Code	DUEN(L)-MUG-158	
Subject code											
Responsible educational unit		Institute of Engineering									
Name of Mandatory Preliminary Study		DUEN-MUG-211									
Number of Lessons									Requirements	Credits (ECTS)	Language of Education
	Lecture		Seminar		Laboratory						
Full-time		2		0		1			F(practical work)	5	Hungarian
Correspondence		10				4					
Teacher responsible for the course		Name		Dr. Andras Nagy					Position	assoc. prof.	
Educational goals		Learning of structure, properties, operation and application of sensors and actuators									
Typical delivery methods		Lecture		In a classroom with the use of projector or computer in each lecture.							
		Seminar									
		Laboratory		Laboratory work							
Requirements		**Knowledge** – Gets acquainted with the principles and methods of mechatronics systems, focused on sensors and actuators – Has a comprehensive knowledge of mechatronics taking place in the applied work									
		Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to understand mechatronics sensors and actuators									
		Attitude – He is open to learning about and accepting knowledge related to mechatronics related to his / her qualification or field. Interested in new methods and tools related to the field.									
		Autonomy and responsibility Taking responsibility for one's own work and the work of others.									
Brief description of the subject content		Lecture: Physics of sensors and actuators. Sensor parameters, structure, properties and applications. Actuator parameters, structure, operation and characteristics. Lab: Measurement of sensors: temperature, acceleration, power, luminous intensity, speed, position etc. Measurement of actuators: examination and control of direct current motors									
Activity forms of students		Case study analysis, Presentations, Individual work, Frontal class work									
Compulsory reading and its availability		Materials on MOODLE									
Recommended reading and its availability		ɒert H. Bishop: The mechatronics handbook, CRC Press LLC, NY Washington, 2002 ISBN: 0-8493-0066-5 ɣid G. Alciatore, Michael B. Histand: Introduction to Mechatronics and Measurement Systems, 4th Ed., Mc Graw Hill, 2012, ISBN: 978-0-07-338023-0 ɒert H. Bishop: Mechatronics, An introduction, Taylor&Francis, CRC Press, 2006, ISBN: 0-8493-6358-6 lfrey C. Onwubolu: Mechatronics principles and applications, Elsevier, 2005, ISBN: 0-7506-6379-0 l Sclater: Mechanisms and mechanical devices sourcebook, 5th Ed., Mc Graw Hill, 2011, ISBN: 978-0-07-170441-0									
Hand-in Assignments/ measurement reports		Processing and analysis of a chosen case study (On week 11th)									
Description of midterm tests		Midterm tests on week 10th.									

MECHATRONIC SYSTEMS 1.

DUEN-MUG-114 3/0/1/V/5
DUEL-MUG-114 15/0/5/V/5

Responsible Education Unit: Institute of Engineering

Prerequisites:
DUEN(L)-MUG-211

Typical delivery methods:
Lecture: Oral with projector.
Exercise: -
Lab: Laboratory work.

Learning outcomes and objectives:
Learning the structure and operation of modern automatized systems.

Contents:
Lecture: Definition of programmable logical controllers, their structure, operation and programming. Goal and system of manufacturing automatization. Flexible manufacturing systems, principles of automatization. Structure of machines, powertrain in open and closed control loop. Adaptive control of CNC machines. Distribution of control, technological process. Structure and application of robots.

Lab: Assembly of systems operated by programmable logical controller.

Forms of student activity:
Lecture: note-text processing 40%, independent processing of theoretical 20%, problem solving 40%.
Lab: note-text processing 10%, homework 20%, measure 40%, protocol 30%.

Compulsory reading and its availability:
Godfrey C. Onwubolu: Mechatronics principles and applications, Elsevier, 2005, ISBN: 0-7506-6379-0
Kevin Collins: PLC Programming for Industrial Automation, Exposure Publishing, 2007 ISBN: 1-8468-5598-5

Recommended reading and its availability:
David G. Alciatore, Michael B. Histand: Introduction to Mechatronics and Measurement Systems, 4th Ed., Mc Graw Hill, 2012, ISBN: 978-0-07-338023-0
Robert H. Bishop: Mechatronics, An introduction, Taylor&Francis, CRC Press, 2006, ISBN: 0-8493-6358-6
Neil Sclater: Mechanisms and mechanical devices sourcebook, 5th Ed., Mc Graw Hill, 2011, ISBN: 978-0-07-170441-0

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian:</td><td colspan="3">Mechatronikai projekt 1.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-113</td></tr>
<tr><td>English:</td><td colspan="3">Mechatronic project 1.</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="2">Institute:</td><td colspan="5">University of Dunaújváros</td></tr>
<tr><td colspan="2">Compulsory pre-subject:</td><td colspan="3">-</td><td>Code:</td><td>-</td></tr>
<tr><td rowspan="2">Type</td><td colspan="2" rowspan="2">Number of lessons per week
Lecture / Seminar / Practice/Laboratory</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td colspan="2" rowspan="2">Language of teaching</td></tr>
<tr></tr>
<tr><td>Full-time</td><td>39</td><td>Week 0 / Week 1 / Week 2</td><td rowspan="2">semester grade</td><td rowspan="2">5</td><td colspan="2" rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term 10 / Term 5 / Term 10</td></tr>
<tr><td colspan="2">Teacher responsible for the subject</td><td>name:</td><td colspan="2">Dr. Attila Kővári</td><td>position:</td><td>associate professor</td></tr>
<tr><td colspan="2">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="5"></td></tr>
<tr><td colspan="2" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="4">-</td></tr>
<tr><td>Seminar:</td><td colspan="4">Project report and discussion using student’s project documentation or online consultations.</td></tr>
<tr><td>Laboratory</td><td colspan="4">Laboratory tasks can be performed by contact or with the help of online laboratory tasks and guides, supplemented by online consultations.</td></tr>
<tr><td>Other:</td><td colspan="4">-</td></tr>
<tr><td colspan="2">Requirements
(in learning outcomes)</td><td colspan="5">Knowledge
Comprehensive knowledge of the basic facts, directions and boundaries of the field of mechatronics.
Knows the general and specific rules, contexts and procedures required for cultivating the field of mechatronics.
Knows the conceptual system, the most important connections and theories related to the field of expertise.
Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of this field.
Familiar with the measurement procedures used in mechanical engineering, their tools, instruments and measuring equipment at the application level.
Ability
Able to plan, organize and conduct independent learning.
Able to identify routine professional problems, to solve them in principle and to explore, formulate and solve a practical background.
Able to understand and use the typical literature, computer technology and library resources of the field.
Attitude
Aware of the importance of technical activity.
Committed to implementing modern technical applications.
Autonomy and responsibility
Able to develop and implement engineering processes and tools.</td></tr>
<tr><td colspan="2">Short description of subject content</td><td colspan="5">Elaboration of a complex mechatronics task primarily related to the topic of the planned professional practice. Discuss the project task, prepare a basic system plan, determine the necessary tools. Monitoring the progress of the project task, implementation steps, reports, coordination of problems.
In the case of engineering teachers, the definition of a project task related to the teaching of the field of mechanical engineering and/or mechatronics.</td></tr>
<tr><td colspan="2">Forms of student activity</td><td colspan="5">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="2">Compulsory literature</td><td colspan="5">Materials in moodle system.</td></tr>
<tr><td colspan="2">Optional literature</td><td colspan="5">-</td></tr>
<tr><td colspan="2">Compulsory tasks during semester</td><td colspan="5">Preparation and presentation of a report according to the instructor's instructions.</td></tr>
<tr><td colspan="2">Midterm tests and their timing</td><td colspan="5">-</td></tr>
</table>

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian:</td><td colspan="4">Villamos hajtástechnika</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-259</td></tr>
<tr><td>English:</td><td colspan="4">Electric drive technology</td></tr>
<tr><td colspan="2">Institute:</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Compulsory pre-subject:</td><td colspan="4">-</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="4">Number of lessons per week</td><td rowspan="2">Requirements</td><td>Credit</td><td>Language of teaching</td></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Seminar</td><td colspan="2">Practice/Laboratory</td><td></td><td></td></tr>
<tr><td>Full-time</td><td>39</td><td>Week</td><td>3</td><td>Week</td><td>0</td><td>Week</td><td>0</td><td rowspan="2">semester grade</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term</td><td>15</td><td>Term</td><td>0</td><td>Term</td><td>0</td></tr>
<tr><td colspan="2">Teacher responsible for the subject</td><td>name:</td><td colspan="3">Dr. Attila Kővári</td><td>position:</td><td>associate professor</td></tr>
<tr><td colspan="2">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="6"></td></tr>
<tr><td colspan="2" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="5">Lecture with a projector or online course materials (note, lecture student, other), guides to learn or online consultations.</td></tr>
<tr><td>Seminar:</td><td colspan="5">-</td></tr>
<tr><td>Laboratory</td><td colspan="5">-</td></tr>
<tr><td>Other:</td><td colspan="5">-</td></tr>
<tr><td colspan="2">Requirements
(in learning outcomes)</td><td colspan="6">Knowledge
Comprehensive knowledge of the basic facts, directions and boundaries of the field of electrical drives.
Knows the general and specific rules, contexts and procedures required for cultivating the field of electric drives.
Knows the conceptual system, the most important connections and theories related to the field of expertise.
Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of this field.
Familiar with the measurement procedures used in mechanical engineering, their tools, instruments and measuring equipment at the application level.
Ability
Able to plan, organize and conduct independent learning.
Able to identify routine professional problems, to solve them in principle and to explore, formulate and solve a practical background.
Able to understand and use the typical literature, computer technology and library resources of the field.
Attitude
Aware of the importance of technical activity.
Committed to implementing modern technical applications.
Autonomy and responsibility
Able to develop and implement engineering processes and tools.</td></tr>
<tr><td colspan="2">Short description of subject content</td><td colspan="6">Types of electric drives, power supply. Modern brushed DC, brushless DC, synchronous and asynchronous AC drives, construction and operation of their drive system. Structure and power supply of electric vehicles.
DC chopper, stepper motor, asynchronous motor drive fed from inverter.</td></tr>
<tr><td colspan="2">Forms of student activity</td><td colspan="6">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="2">Compulsory literature</td><td colspan="6">Materials in moodle system.</td></tr>
<tr><td colspan="2">Optional literature</td><td colspan="6">Austin Hughes: Electric Motors and Drives, Fundamentals, Types and Applications, Third Edition, ELSEVIER, 2006
http://www.emic-bg.org/files/Electric_Motors___Drives.pdf</td></tr>
<tr><td colspan="2">Compulsory tasks during semester</td><td colspan="6">Defined by the teacher.</td></tr>
<tr><td colspan="2">Midterm tests and their timing</td><td colspan="6">2 tests as given in the first lecture, retake in the following week, semester evaluation in the last week.</td></tr>
</table>

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="5">Mechatronikai rendszerek programozása</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="5">MECHATRONICS SYSTEMS PROGRAMMING</td><td>Code</td><td>DUEN(L)-MUG-218</td></tr>
<tr><td colspan="2">Subject code</td><td colspan="7"></td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="7">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="7">DUEN-MUG-155</td></tr>
<tr><td colspan="2">Number of Lessons</td><td colspan="5"></td><td rowspan="2">Requirements</td><td rowspan="2">Credits (ECTS)</td><td rowspan="2">Language of Education</td></tr>
<tr><td></td><td>Lecture</td><td colspan="2">Seminar</td><td colspan="2">Laboratory</td></tr>
<tr><td>Full-time</td><td></td><td></td><td>0</td><td></td><td>0</td><td>3</td><td rowspan="2">F (practical work)</td><td rowspan="2">5</td><td rowspan="2">Hungarian</td></tr>
<tr><td>Correspondence</td><td></td><td></td><td>0</td><td></td><td>0</td><td>10</td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td colspan="2">Name</td><td colspan="3">Dr. Andras Nagy</td><td>Position</td><td>assoc. prof.</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="7">ning the programming of computer-based guide system through solving mechatronic problems.</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td colspan="2">Lecture</td><td colspan="5"></td></tr>
<tr><td colspan="2">Seminar</td><td colspan="5"></td></tr>
<tr><td colspan="2">Laboratory</td><td colspan="5">Laboratory work</td></tr>
<tr><td colspan="2" rowspan="4">Requirements</td><td colspan="7">Knowledge
– Gets acquainted with the principles and methods of programming, including microcontrollers and PLCs.
– Has a comprehensive knowledge of mechatronics taking place in the applied work</td></tr>
<tr><td colspan="7">Ability
– Performs a job that matches his qualifications.
– Able to plan, organize and conduct independent learning.
– Able to understand mechatronics systems and programming methods</td></tr>
<tr><td colspan="7">Attitude
- He is open to learning about and accepting knowledge related to mechatronics related to his / her qualification or field. Interested in new methods and tools related to the field.</td></tr>
<tr><td colspan="7">Autonomy and responsibility
Taking responsibility for one’s own work and the work of others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="7">Learning development environment, learning programming basics through examples. Serial communication achieved by programmable digital guide unit, measure data collection, signal processing, display, data saving, achieving human-computer interface.</td></tr>
<tr><td colspan="2">Activity forms of students</td><td colspan="7">Individual work, Frontal class work, Practical programming</td></tr>
<tr><td colspan="2">Compulsory reading and its availability</td><td colspan="7">Materials on MOODLE</td></tr>
<tr><td colspan="2">Recommended reading and its availability</td><td colspan="7">oduction to LabVIEW
(http://www.ni.com/getting-started/labview-basics/)</td></tr>
<tr><td colspan="2">Hand-in Assignments/ measurement reports</td><td colspan="7">Solving the programming of a chosen problem (On week 10th)</td></tr>
<tr><td colspan="2">Description of midterm tests</td><td colspan="7">N/A</td></tr>
</table>

Subject name	In Hungarian	**Mechatronikai rendszerek 2**		Level	A
	In English	**MECHATRONICS SYSTEMS 2**		Code	DUEN(L)-MUG-258
Subject code					
Responsible educational unit		Institute of Engineering			
Name of Mandatory Preliminary Study		DUEN-MUG-114			
Number of Lessons			Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory		
Full-time	2	0	1	V (exam)	5	Hungarian
Correspondence	10		4			
Teacher responsible for the course		Name	Dr. Andras Nagy	Position	assoc. prof.
Educational goals		Learning structure of vehicles			
Typical delivery methods		Lecture	In a classroom with the use of projector or computer in each lecture.		
		Seminar			
		Laboratory	Laboratory work		
Requirements		**Knowledge** – Gets acquainted with the principles and methods of mechatronics systems, including manufacturing machines, industrial control systems and vehicles – Has a comprehensive knowledge of mechatronics taking place in the applied work			
		Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to understand mechatronics systems and operations			
		Attitude – He is open to learning about and accepting knowledge related to mechatronics related to his / her qualification or field. Interested in new methods and tools related to the field.			
		Autonomy and responsibility Taking responsibility for one's own work and the work of others.			
Brief description of the subject content		General structure of vehicles, tasks, structure and types of suspension system. Forces influencing the vehicle, steering dynamics, traffic safety. Operation of clutches. Suspension and damping. Tasks of steering systems, their structure, differential locks, servo-steering, braking, requirements, structure of braking system, hydraulic and pneumatic braking system, structural elements of braking systems.			
Activity forms of students		Case study analysis, Presentations, Individual work, Frontal class work, Essay writing			
Compulsory reading and its availability		Materials on MOODLE			
Recommended reading and its availability		Godfrey C. Onwubolu: Mechatronics principles and applications, Elsevier, 2005, ISBN: 0-7506-6379-0 Robert H. Bishop: Mechatronics, An introduction, Taylor&Francis, CRC Press, 2006, ISBN: 0-8493-6358-6 l Sclater: Mechanisms and mechanical devices sourcebook, 5th Ed., Mc Graw Hill, 2011, ISBN: 978-0-07-170441-0			
Hand-in Assignments/ measurement reports		Processing and analysis of a chosen case study (On week 12th)			
Description of midterm tests		Midterm tests on week 9th.			

<table>
<tr><td rowspan="2">Title of subject:</td><td>Hungarian:</td><td colspan="4">Mechatronikai projekt 2.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-217</td></tr>
<tr><td>English:</td><td colspan="4">Mechatronic project 2.</td></tr>
<tr><td colspan="2">Institute:</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Compulsory pre-subject:</td><td colspan="4">-</td><td>Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="4">Number of lessons per week</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Seminar</td><td colspan="2">Practice/Laboratory</td></tr>
<tr><td>Full-time</td><td>39</td><td>Week</td><td>0</td><td>Week</td><td>1</td><td>Week</td><td>2</td><td rowspan="2">semester grade</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part-time</td><td>15</td><td>Term</td><td>10</td><td>Term</td><td>5</td><td>Term</td><td>10</td></tr>
<tr><td colspan="2">Teacher responsible for the subject</td><td>name:</td><td colspan="3">Dr. Attila Kővári</td><td>position:</td><td>associate professor</td></tr>
<tr><td colspan="2">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="6"></td></tr>
<tr><td colspan="2" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="5">-</td></tr>
<tr><td>Seminar:</td><td colspan="5">Project report and discussion using student’s project documentation or online consultations.</td></tr>
<tr><td>Laboratory</td><td colspan="5">Laboratory tasks can be performed by contact or with the help of online laboratory tasks and guides, supplemented by online consultations.</td></tr>
<tr><td>Other:</td><td colspan="5">-</td></tr>
<tr><td colspan="2">Requirements
(in learning outcomes)</td><td colspan="6">Knowledge
Comprehensive knowledge of the basic facts, directions and boundaries of the field of mechatronics.
Knows the general and specific rules, contexts and procedures required for cultivating the field of mechatronics.
Knows the conceptual system, the most important connections and theories related to the field of expertise.
Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of this field.
Familiar with the measurement procedures used in mechanical engineering, their tools, instruments and measuring equipment at the application level.
Ability
Able to plan, organize and conduct independent learning.
Able to identify routine professional problems, to solve them in principle and to explore, formulate and solve a practical background.
Able to understand and use the typical literature, computer technology and library resources of the field.
Attitude
Aware of the importance of technical activity.
Committed to implementing modern technical applications.
Autonomy and responsibility
Able to develop and implement engineering processes and tools.</td></tr>
<tr><td colspan="2">Short description of subject content</td><td colspan="6">Implementation of a complex mechatronics task related to the topic of the planned professional practice. Discussing the project task, monitoring the progress of the project task, implementation steps, reports, coordinating problems that have arisen.
In the case of engineering teachers, the definition of a project task related to the teaching of the field of mechanical engineering and/or mechatronics.</td></tr>
<tr><td colspan="2">Forms of student activity</td><td colspan="6">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="2">Compulsory literature</td><td colspan="6">Materials in moodle system.</td></tr>
<tr><td colspan="2">Optional literature</td><td colspan="6">-</td></tr>
<tr><td colspan="2">Compulsory tasks during semester</td><td colspan="6">Preparation and presentation of a report according to the instructor's instructions.</td></tr>
<tr><td colspan="2">Midterm tests and their timing</td><td colspan="6">-</td></tr>
</table>

MAINTENANCE SPECIALISATION

PRODUCTION PLANNING, CAM

DUEN-MUG-111 **2/1/1/F/5**

Prerequisites: DUEN-MUG-252

Learning outcomes and objectives:

The students get to know the documentations of the production technological micro-planning, how to use the operation plan, the operational instructions, and the accompanying document. . The students become familiar with the technological role and structure of the instruments and they participate in the design of a simple instrument.

The subject provides information about the structure and application of the NC-controlled labouring machines, and the students acquire practical knowledge in CAM programming.

Contents:

The selection of pre-products. Specification of the tolerances of pre-products and the calculation of the final dimensions. Presentation of a numeric example. The definition of the operation and making the action sequence. Working out the operational instructions. The realisation forms of operation process plan. Presentation of an example. Making the technological documentation. The systematisation of the documentation. Basis, basis-selection fault, size-chains. The process of the instrument-design. Static, kinematic and dynamic calculations. Dimensioning the elements of instruments. Drilling, cutting and lathe instruments, their main functions and characteristics.

The basic structure of the CNC machines. Standards in relation to the CNC machines. The operational structure of the labouring centers. The fundamentals of CNC machine programming. NCT instructions. Tooling of the CNC machines. Presentation of the CAM formal processes.

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Tribológia</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="4">Tribology</td><td>Code</td><td>DUEN(L)-MUG-118</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="6">DFAN(L)-MUG-110 Machine structures 2.
DUEN(L)-MUT-250 Thermodynamics and Hydrodynamics</td></tr>
<tr><td colspan="3">Number of Lessons</td><td colspan="3" rowspan="2">Requirements</td><td rowspan="2">Credits (ECTS)</td><td rowspan="2">Language of Education</td></tr>
<tr><td></td><td>Lecture</td><td>Seminar</td><td>Laboratory</td></tr>
<tr><td>Full-time</td><td></td><td></td><td>2</td><td></td><td>1</td><td></td><td>F (practical mark)</td><td>5</td><td>Hungarian</td></tr>
<tr><td>Correspondence</td><td></td><td></td><td>10</td><td></td><td>5</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td>Name</td><td colspan="3">Dr. Attila Szabo</td><td>Position</td><td colspan="2">assoc. prof.</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">The attendants must be able to analyse the tribology systems, determine the structural and load data, have to be able to identify the mayor wearing processes in the wiev of tribological properties. The life time and third body most be determined generally. They have to plan and run tribological systems on the basis of propertise of lubrication state. They have to learn the different fields of the applied tribology (processing, mechanical structures, thermal prime mover), as well as the related supplier systems run and configuration.</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td>Lecture</td><td colspan="5">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Seminar</td><td colspan="5">Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work</td></tr>
<tr><td>Laboratory</td><td colspan="5">-</td></tr>
<tr><td colspan="2" rowspan="4">Requirements</td><td colspan="6">Knowledge
– Gets acquainted with the principles and methods of machine design and machine manufacturing technology procedures based on tribological aspects.
– Has a comprehensive knowledge of the tribological processes taking place in the applied work and power machines and mechanical equipment</td></tr>
<tr><td colspan="6">Ability
– Performs a job that matches his qualifications.
– Able to plan, organize and conduct independent learning.
– Able to diagnose mechanical failures, select remedial actions, solve repair technology tasks</td></tr>
<tr><td colspan="6">Attitude
– He is open to learning about and accepting knowledge related to tribology related to his / her qualification or field. Interested in new methods and tools related to the field.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
Taking responsibility for one’s own work and the work of others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="6">Definition of tribology. Description of tribological systems. Friction processes. Analysation of tribological processes. Surface quality of mechanical parts. The propertiese of surface layers. The relation between tribological duty and wearing mechanisms. Type of wearings. The practical methods of wearing measurement. The analytical method of wearing determination. Introduction of lubricants. Lubricants propertiese. Investigation of lubricants. Selection of lubricants. Selections of structural materials. Grading of lubrication states: Hydrodynamic lubrication (HD, EHD), Boundary lubrication, Extreme pressure lubrication, Process tribology: cutting, hot and cool deformation. Lubrication of mechanical parts and structures.</td></tr>
<tr><td colspan="2">Activity forms of students</td><td colspan="6">Case study analysis, Presentations, Individual work, Frontal class work, Essay writing</td></tr>
<tr><td colspan="2">Compulsory reading and its availability</td><td colspan="6">Materials on MOODLE</td></tr>
<tr><td colspan="2">Recommended reading and its availability</td><td colspan="6">ohar (Imperial College London, UK) & H Rahnejat (Loughborough University, UK): FUNDAMENTALS OF TRIBOLOGY
idon Stachowiak and Andrew W Batchelor : Engineering Tribology, Third Edition
Prasanta Sahool</td></tr>
<tr><td colspan="2">Hand-in Assignments/ measurement reports</td><td colspan="6">Processing and analysis of 2 chosen case study (On week 8th and 13rd)</td></tr>
<tr><td colspan="2">Description of midterm tests</td><td colspan="6">Midterm tests on weeks 7th and 12th.</td></tr>
</table>

TECHNICAL DIAGNOSTICS 1.

DUEN-MUG-157 **2/1/1/V/5**

Prerequisites: DUEN-IMA-110, DUEN-MUG-153

Learning outcomes and objectives:

The objective of the course is the foundation of the up-to -date maintenance technologies and the acquirement of the basics knowledge of theoretical and practical vibration diagnostics of rorating machinery.

Contents:

In the framework of the subject students become familiar with the essence of different maintenance strategies (run to failure, preventive, predictive and proactive maintenance). They acquire the basics of the vibration theory, the description of the single-degree of freedom harmonic vibration, and the forced vibration without and with damping. We become aquinted with additivity of vibration, the complex vibration, the scales of amlitude and phase, as well as the relationships between time- and frequency ranges, the Fourier transformation. Students acuire the matter of measurements and analysis of the vibration measurements, the law of analog-digital signal processing, and its problems. Students learn the proper use of vibration analyzers, its theory and practice, as well as the aliasing phenomena and its handling, and the windowing technics. Students become aquinted with such type of methodology like Orbit analysis, time.sinchronous measurements and Crest Factor analysis. Passing the analysis of forcing frequencies we expend time to the analysis of eigenfrequencies, inspection of phenomena resonance, recognition of critical shaft speed of rotating equipment. We master different methods of identification of bearing defects like method of analysis of bearing tones and Cepstrum analysis. Students acquire the theoretical and practical basics of work of the modern rule-based expert systems int he field of vibration diagnostics.

Recommended reading and its availability:

Dr. Istvan NAGY, Condition Based Maintenance, Technical Diagnostics I., Vibration Analysis, Publisher Delta-3N Ltd., 2007, ISBN 978-963-06- 0806 0.

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Karbantartási technológiák 1.</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="4">Maintenance technologies 1.</td><td>Code</td><td>DUEN(L)-MUG-112</td></tr>
<tr><td colspan="2">Subject code</td><td colspan="6"></td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="6">DUEN(L)-MUG-252 Production engineering
DUEN(L)-MUA-210 Welding</td></tr>
<tr><td colspan="3">Number of Lessons</td><td colspan="3"></td><td rowspan="2">Requirements</td><td>Credits (ECTS)</td><td>Language of Education</td></tr>
<tr><td></td><td>Lecture</td><td>Seminar</td><td>Laboratory</td><td></td><td></td><td></td></tr>
<tr><td>Full-time</td><td></td><td>2</td><td>1</td><td></td><td></td><td rowspan="2">CA (Continuous assessment)</td><td rowspan="2">5</td><td rowspan="2">Hungarian</td></tr>
<tr><td>Correspondence</td><td></td><td>10</td><td>5</td><td></td><td></td></tr>
<tr><td colspan="3">Teacher responsible for the course</td><td colspan="2">Name</td><td colspan="2">Dr. Attila Szabo</td><td>Position</td><td>assoc. prof.</td></tr>
<tr><td colspan="3">Educational goals</td><td colspan="6">The students should be able
- to analyse the damaging processes and the reduce their effects;
- to choose the repairing technologies, to plan the dismounting and assembly technologiers;
- to plan the preceding and following operations;
- to analyse and put into practice the assembly size-chain.</td></tr>
<tr><td colspan="3" rowspan="3">Typical delivery methods</td><td>Lecture</td><td colspan="5">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Seminar</td><td colspan="5">Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work</td></tr>
<tr><td>Laboratory</td><td colspan="5">-</td></tr>
<tr><td colspan="3" rowspan="4">Requirements</td><td colspan="6">Knowledge
Able to analytically examine the damage processes of machines and equipment, to identify the causes of errors and to eliminate them professionally.</td></tr>
<tr><td colspan="6">Ability
- Ability to apply and further develop procedures, models, information technologies used in the design, organization and operation of mechanical systems and processes.
- Prepared for quality assurance of mechanical systems, technologies and processes, solving measurement and process control tasks.
- Ability to solve creative problems, solve complex tasks flexibly, as well as lifelong learning and commitment to diversity and value-based</td></tr>
<tr><td colspan="6">Attitude
- He is open to learning about and accepting knowledge related to tribology related to his / her qualification or field. Interested in new methods and tools related to the field.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
Taking responsibility for one’s own work and the work of others.</td></tr>
<tr><td colspan="3">Brief description of the subject content</td><td colspan="6">The damaging effects occuring on the surface of machine parts and volume and their consequences. Classification of the breakdowns. The surface quality; factors affecting the surface quality. Analysis of damages. The connection between the damages and the recovery technologies affecting the surface quality. The selection of recovery technologies. Cleaning the machines. Dismounting and assembly of the machines. Planning the dismounting and assembly technologies.</td></tr>
<tr><td colspan="3">Activity forms of students</td><td colspan="6">Case study analysis, Presentations, Individual work, Frontal class work, Essay writing</td></tr>
<tr><td colspan="3">Compulsory reading and its availability</td><td colspan="6">Materials on MOODLE</td></tr>
<tr><td colspan="3">Recommended reading and its availability</td><td colspan="6">-</td></tr>
<tr><td colspan="3">Hand-in Assignments/ measurement reports</td><td colspan="6">Processing and analysis of 2 chosen case study (On week 8th and 13rd)</td></tr>
<tr><td colspan="3">Description of midterm tests</td><td colspan="6">Midterm tests on weeks 7th and 12th.</td></tr>
</table>

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Karbantartási technológiák 2.</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="4">Maintenance technologies 2.</td><td>Code</td><td>DUEN(L)-MUG-256</td></tr>
<tr><td colspan="2">Subject code</td><td colspan="6"></td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="6">DUEN(L)-MUG-112 Maintenance technologies 1.</td></tr>
<tr><td colspan="2">Number of Lessons</td><td colspan="4"></td><td rowspan="2">Requirements</td><td>Credits (ECTS)</td><td>Language of Education</td></tr>
<tr><td></td><td>Lecture</td><td colspan="2">Seminar</td><td colspan="2">Laboratory</td><td></td><td></td></tr>
<tr><td>Full-time</td><td></td><td>2</td><td></td><td>1</td><td></td><td rowspan="2">Exam</td><td rowspan="2">5</td><td rowspan="2">Hungarian</td></tr>
<tr><td>Correspondence</td><td></td><td>10</td><td></td><td>5</td><td></td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td colspan="2">Name</td><td colspan="2">Dr. Attila Szabo</td><td>Position</td><td colspan="2">assoc. prof.</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">The technological methods of the recovery. Recovery:
- with mechanical methods;
- with welding;
- with soft and hard soldering;
- with thermal spread;
- with gluing and with plastics.
Large-energy-density technologies and surface hardening processes modifying the surface integrity. The economicalness and organisation of machine maintenance. The indexes of economicalness of machine maintenance</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td colspan="2">Lecture</td><td colspan="4">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td colspan="2">Seminar</td><td colspan="4">Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work</td></tr>
<tr><td colspan="2">Laboratory</td><td colspan="4">-</td></tr>
<tr><td colspan="2" rowspan="4">Requirements</td><td colspan="6">Knowledge
Able to analytically examine the damage processes of machines and equipment, to identify the causes of errors and to eliminate them professionally</td></tr>
<tr><td colspan="6">Ability
- He performs a job that matches his qualifications.
- Able to plan, organize and conduct independent learning.
- Able to diagnose mechanical failures, select remedial actions, solve repair technology tasks</td></tr>
<tr><td colspan="6">Attitude
- He is open to learning about and accepting knowledge related to tribology related to his / her qualification or field. Interested in new methods and tools related to the field.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
Taking responsibility for one’s own work and the work of others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="6">The students should be able to design the recovery technologies and to control the implementation of the recovery technologies. The students should be able to calculate the recovery expenses. He should be able to select the recovery technology, which would be the appropriate in accordance with the situation and the goal on the basis of the technical and economic aspects.</td></tr>
<tr><td colspan="2">Activity forms of students</td><td colspan="6">Case study analysis, Presentations, Individual work, Frontal class work, Essay writing</td></tr>
<tr><td colspan="2">Compulsory reading and its availability</td><td colspan="6">Materials on MOODLE</td></tr>
<tr><td colspan="2">Recommended reading and its availability</td><td colspan="6">Lech Pawlowski, The Science and Engineering of Thermal Spray Coatings, John Wiley & Sons, 2008
William A. Bowditch; Kevin E. Bowditch; Mark A. Bowditch, Welding Technology Fundamentals Goodheart-Willcox, 2009</td></tr>
<tr><td colspan="2">Hand-in Assignments/ measurement reports</td><td colspan="6">Processing and analysis of 2 chosen case study (On week 8th and 13rd)</td></tr>
<tr><td colspan="2">Description of midterm tests</td><td colspan="6">Midterm tests on weeks 7th and 12th.</td></tr>
</table>

Subject name	In Hungarian	**Karbantartás tervezése és szervezése**						Level	A	
	In English	**Maintenance planning and organisation**						Code	DUEN(L)-MUG-513	
Responsible educational unit		Institute of Engineering								
Name of Mandatory Preliminary Study		-								
Number of Lessons							Requirements	Credits (ECTS)	Language of Education	
	Lecture		Seminar		Laboratory					
Full-time		2		1			Exam	5	Hungarian	
Correspondence		10		5						
Teacher responsible for the course	Name		Dr. Attila Szabo					Position	assoc. prof.	
Educational goals	Based on the attainment of modern trends in maintenance strategies, the students become capable of planning and optimizing the maintenance activities, recognizing and eliminating the weak points of equipment, selecting durability improving technologies and planning specific maintenance technologies.									
Typical delivery methods	Lecture	In a classroom with the use of projector or computer in each lecture.								
	Seminar	Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work								
	Laboratory	-								
Requirements	**Knowledge** - Has a wide range of theoretical and practical training, methodological and practical knowledge for the design, manufacture, modeling, operation and management of complex mechanical systems and processes. - Has a comprehensive knowledge of machine, system and process design methods in the mechanical field									
	Ability - Ability to apply and further develop procedures, models, information technologies used in the design, organization and operation of mechanical systems and processes. - Prepared for quality assurance of mechanical systems, technologies and processes, solving measurement and process control tasks. - Ability to solve creative problems, solve complex tasks flexibly, as well as lifelong learning.									
	Attitude Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability									
	Autonomy and responsibility - Shares the acquired knowledge and experience with the practitioners of his / her field in formal, non-formal and informal forms of information transfer. - Evaluates the work of his subordinates, promotes their professional development by sharing critical remarks. - In making its decisions, it takes into account the principles and application of environmental protection, quality management, consumer protection, product liability, equal access, occupational health and safety, technical, economic and legal regulations, and basic ethical standards.									
Brief description of the subject content	The modern interpretation of the definition of „maintenance". Maintenance and terotechnology. The connection between production and maintenance. The double-circled model of the machine life-time. Effects that can damage the machine parts. Appearance forms of damages. Deterioration reserve and its wearing out. Breakdowns and operational errors. Weak-point analysis. The probabilistic examination of operational processes. The calculation method of maintenance cycle-time. Risk analysis in maintenance. The process of root-reason-analysis. Fault-tree analysis. Maintenance strategies and philosophies. The development of maintenance. Faliure Based Corective Maintenance (FBCM). Planned Preventive Maintenance. Parameter Condition Based Maintenance (PCBM). Reliability Centred Maintenance (RCM). Risk Based Maintenance (RBM); Risk Based Inspection and Maintenance (RBIM). Total Productive Maintenance (TPM). Automatic Maintenance (AM).									
Activity forms of students	Case study analysis, Presentations, Individual work, Frontal class work, Essay writing									
Compulsory reading and its availability	David J Smith: Reliability, Maintainability and Risk, Elsevier, 2013. Materials on MOODLE									
Recommended reading and its availability	-									
Hand-in Assignments/ measurement reports	Processing and analysis of 2 chosen case study (On week 8th and 13rd)									
Description of midterm tests	Midterm tests on weeks 7th and 12th.									

TECHNICAL DIAGNOSTICS 2.

DUEN-MUG-219 **2/1/2/F/5**

Prerequisites: DUEN-MUG-157, DUEN-MUG-151

Learning outcomes and objectives:

Cognition the basics of theory and mathematical description of modern systems used in diagnostics, the signals theory and the practical signal processing. Aquintance of the details of introduces functions and their mathematical deduction. Certain handling of transformations in the time- and frequency range, interpretation of functions deducted by signal processing and quantitative knowledge of measurements and diagnostic methods based on analysis of these functions as well as mathematical basics and usabilitity for diagnostics. The aim of the course is the acquirement of basics of up-to-date theory and practice of technics and methods of fault identifications (vibration analysis, Infrared Thermography, Ferrography, Ultrasound Fault Detection and Leak Detection), and the deeper knowledge of complicated treatment of methods in vibration analysis.

Contents:

In topics of balancing rotating equipments students become acquainted with the basics of theory and practice in a modern laboratory. The attendees learn the steps of the modern methods of laser shaft alignenet. Students pick up the steps of developement of knowledge-and database vibration diagnostics expert system, learn to prepar measurements and analysis of vibration measurements using expert systems. Students become competent to develop and operate vibration diagnostic expert systems supporting the predictive maintenance strategies at companies in industry. We discuss construction of the machine protection systems, their functions, surveillance of the shaft motion, orbit analysis. Attendees become familiar with the theoretical basics of the infrared analysis, become acquinted with the use of infracameras in laboratory and computer processing of infra images for diagnose mechanical machine faults as well as electrical faults and identification of isolation deficiency of buildings. Students learn the different methods of Ultrasound fault detection and leakage detection.

Recommended reading and its availability:

Dr. Istvan NAGY, Condition Based Maintenance, Technical Diagnostics I., Vibration Analysis, Publisher Delta-3N Ltd., 2007, ISBN 978-963-06- 0806 0.

MAINTENANCE STRATEGY

DUEN-MUG-254 **2/1/0/V/5**

Prerequisites: DUEN-MUG-210, DUEN-MUG-251

Learning outcomes and objectives:

The student should be able to plan the maintenance strategy based on reliable operation.

Contents:

The modern interpretation of the definition of „maintenance". Maintenance and terotechnology. The connection between production and maintenance. The double-circled model of the machine life-time. Effects that can damage the machine parts. Appearance forms of damages. Deterioration reserve and its wearing out. Breakdowns and operational errors. Weak-point analysis. The probabilistic examination of operational processes. The calculation method of maintenance cycle-time. Risk analysis in maintenance. The process of root-reason-analysis. Fault-tree analysis. Maintenance strategies and philosophies. The development of maintenance. Faliure Based Corective Maintenance (FBCM). Planned Preventive Maintenance. Parameter Condition Based Maintenance (PCBM). Reliability Centred Maintenance (RCM). Risk Based Maintenance (RBM); Risk Based Inspection and Maintenance (RBIM). Total Productive Maintenance (TPM). Automatic Maintenance (AM).

Literature:

David J Smith: Reliability, Maintainability and Risk, Elsevier, 2013.

COMPLEX MACHINE DESIGN

DUEN-MUG-216 **0/0/3/F/5**

Prerequisites:

Learning outcomes and objectives:

The students should be able to do the computer design tasks (CAD), the finite-element static calculation tasks (VEM) and the production planning tasks (CAM) of the mechanical equipments. He is going to learn how to reveal and outline the solution versions of the mechanical engineering design problems, how to set up the selection criteria, how to choose and work out the optimal version. He is going to be able to document the design process and to present the design results.

Contents:

Practising the parametric 3D modelling and drawing on simple machine parts then on complex assembled parts. The elaboration of model-variants. The basics of finite-element method. The structure of program systems, the interpretation of INPUT/ OUTPUT data. Applications in statics, form optimatization. Making the technical documentation. Working out the production technology of machine parts. Choosing the workmanship-cycles. Generating a CNC cycle.

Complusory reading and its availability:

- The manual of SolidWorks design system.

Recommended reading and its availability:

- COSMOSWorks finite-element software manual;
- EdgeCAM technological software manual.

PROFESSIONAL ELECTIVES I. (MECHANICAL ENGINEERING SUBJECTS)

INTRODUCTION TO MECHATRONICS

DUEN-MUG-211 2/0/1/F/5
DUEL-MUG-211 10/0/5/F/5

Responsible Education Unit: Institute of Engineering

Prerequisites: DUEN-MUT-151

Typical delivery methods:
Lecture: Oral with projector.
Exercise: -
Lab: Laboratory work.

Learning outcomes and objectives:
Learning basic knowledge of mechatronics, understanding the basics of operation, control of mechatronic systems.

Contents:
Lecture: Emergence, concept, subject of mechatronics. Signs, classification, process of mechatronic systems, signal conditioning, digitalization, transformation from analogue to digital & digital to analogue. Measurement, measuring devices, transducers. Analogue and digital circuits and their applications.

Lab: Measurement of electric signals, measuring devices, calculation of measuring parameters. Measurement of electric signals in direct and alternate current systems. Measurement of basic electronic and digital circuits. Application of microcontrollers, A/D, D/A transformation.

Forms of Forms of student activity:
Lecture: note-text processing 40%, independent processing of theoretical 20%, problem solving 40%.
Lab: note-text processing 10%, homework 20%, measure 40%, protocol 30%.

Compulsory reading and its availability:
David G. Alciatore, Michael B. Histand: Introduction to Mechatronics and Measurement Systems, 4th Ed., Mc Graw Hill, 2012, ISBN: 978-0-07-338023-0

Recommended reading and its availability:
Robert H. Bishop: The mechatronics handbook, CRC Press LLC, NY Washington, 2002 ISBN: 0-8493-0066-5
Robert H. Bishop: Mechatronics, An introduction, Taylor&Francis, CRC Press, 2006, ISBN: 0-8493-6358-6
Godfrey C. Onwubolu: Mechatronics principles and applications, Elsevier, 2005, ISBN: 0-7506-6379-0
Neil Sclater: Mechanisms and mechanical devices sourcebook, 5th Ed., Mc Graw Hill, 2011, ISBN: 978-0-07-170441-0

WELDING

DFAN-MUG-042 _____ **1/1/1/F/5**
Prerequisites: DUEN-MUA-116

Learning outcomes and objectives:
Students shall know the basis of working of welding and allied processes, welding parameters, their effects and rules of their selection.
They shall know the basis of preparation of welding procedure specification and welding plan. They shall know the essential welding tools and rules of their selection.
Students shall know the welding defects, their effects and methods of their repair. They shall

know the basis of quality management, labour safety and environmental protection of welding.

Contents:
Physical fundamentals of welding.
Technology of main fusion welding processes.
Technology of main pressure welding processes.
Fundamentals of weldability.
Fundamentals of quality management.
Welding documents and their preparation.
Labour safety and environmental protection of welding.
Economics of welding and processes selection by environmental protection aspects.

Recommended reading and its availability:

Welding Handbook, Volume 1, 2, 3 and 4.
American Welding Society, Miami, Fl, The USA, 1991.

PROFESSIONAL ELECTIVES II. (HUMAN KNOWLEDGE SUBJECTS)

HUMAN AND SOCIETY III.

DFAN-TKM-004 **3/0/0/V/5**

Prerequisites: None.

Educational goal (competencies to be acquired):
(Competencies to be Acquired): The communication module as the human form of life-social key-factor approaches. It aims to acquaint students with the major communication theories and models. Students become able to recognize the various aspects of current theories. During the course students learn to communicate with the media, and related basic concepts and principles. The course is completed, the students' professional competencies gained through, which you will be able to social communication is a fundamental theories and concepts with arguments to express their true opinion to formulate, or views to create, and their differentiation from those theories that are not communication theories.

Contents:
The concept of communication, are defined. The criteria of communication. Communication Research Trends. The historical definitions of communicative behavior, communication models. The theory of communicative action, the love of Jaspers's theory of communication, the communications community as I-Thou F. Ebnernél, the theory of participatory communication, communication as the existence of a meaningful conversation with their existing understanding and construction of communication such as the creation of being-communio dimension. Some communicative phenomena: personal expression, social dialogue based on the sign, the dialogue based on the cultural meaning, understanding of being and communication, the communication elements by Em Griffin.

Compulsory reading and its availability:

Em Griffin: A First Look at Communication Theory, McGraw-Hill Companies,Inc., 2011

STATE ADMINISTRATION AND LEGAL KNOWLEDGE

DFAN-TTA-107 **3/0/0/V/5**

Prerequisites: None
Learning outcomes and objectives: The students shall learn the structure of state organisations of the Republic of Hungary, its legal system, the basic concepts and rules of civil and property law, general and special rules of contract-law.

Contents:
Construction of the state organisations of the Republic of Hungary and legislation. The concept, system and main principles of the civil law. The entities of the civil law, ability and capacity. Personality law. Acquisition of law of property and the rights of use. General rules of contract-law, the contract. Breach of contract, discharge and modification. Liability in tort. Bills of sale and their special cases. Business contracts and their special cases. Contract types of credit deals and banking transactions. Certain contracts related to transportation of goods (carriage, shipping). Insurance contracts related to risk distribution. Licence, leasing and franchise contracts. Company rules. Securities, stock-exchange

Compulsory reading and its availability:
Horvath, Zoltan: Handbook on the European Union, HVG-ORAC, Bp., (2007.) Harmathy, Attila (ed.):
Introduction to Hungarian Law, Kluwer, (1998.)

BUSINESS COMMUNICATION

DUEN-TKM-220 **1/2/0/F/5**

Prerequisites: None

Learning outcomes and objectives:

The target of the course is to provide knowledge about business communication to the students and to establish communicative competences on the indispensable areas of business life.

Contents:

Definition and concept system of business communication. Business negotiation strategies, tactics and styles. The success criteria of business presentation. Making a presentation with Microsoft Power Point software and in the Apple system with KeyNote program. Presentation and public performance. The self-knowledge and the personality-centered approach of self-expression. Business ethics and behaviour.