University of Dunaújváros

Mechanical Engineering

BSc

study program

University of Dunaújváros

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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.

Curriculum tables

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**						

Correspondent Mechanical Engineering, Bachelor program

CODES	Modules / Courses	Semesters - classes per semester																																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.		
DUEL-MUT-151	Engineering Physics	5	5	5	V	5																															Dr. Horváth Miklós
DUEL-ISR-010	Informatics	0	0	15	F	5																															Váraljai Mariann
DUEL -TVV-122	Enterpreneurship	5	10	0	F	5																															Dr. Kovács Tamás
DUEL-TKT-151	Economics I.	5	10	0	V	5																															Dr. Fogarasi József
DUEL-MUG-152	Mechanics I.	5	10	0	V	5																															Dr. Zachár András
DUEL-IMA-152	Engineering Mathematics 1.	0	15	0	V	5																															Dr. Jeni Árpád
DUEL-MUT-250	Thermodynamics and Hydrodynamics						5	5	5	V	5																									DUEL-IMA-152 DUEL-MUT-151	Dr. Kiss Endre
DUEL-MUG-212	CAD						0	0	15	F	5																											Dr. Vizi Gábor
DUEL-MUA-211	Chemistry and Materials Science						5	0	10	F	5																											Dr. Kovács Imre
DUEL-MUG-214	Machine Structures 1.						5	10	0	F	5																											Dr. Sánta Róbert
DUEL-MUG-257	Mechanics 2.						5	10	0	V	5																										DUEL-MUG-152	Dr. Zachár András
DUEL-IMA-212	Engineering Mathematics 2.						5	10	0	F	5																										DUEL-IMA-152	Dr. Buzáné dr. Kis Piroska
DUEL-TVV-114	Management											5	10	0	F	5																					Dr. Rajcsányi-Molnár Mónika
DUEL-IMA-110	Mathematics 3.											0	15	0	F	5																				DUEL-IMA-152	Dr. Nagy Bálint
DUEL-MUG-211	Introduction to the Mechatronics											10	0	5	F	5																				DUEL-MUT-151	Dr. Bajor Péter
DUEL-MUA-116	Technology of Structural Materials											5	0	10	F	5																				DUEL-MUA-211	Dr. Csepeli Zsolt
DUEL-MUG-110	Machine Structures 2.											10	5	0	F	5																				DUEL-MUG-152 DUEL-MUG-212 DUEL-MUG-214	Dr. Sánta Róbert
DUEL-MUG-153	Mechanics 3.											5	10	0	V	5																				DUEL-MUG-152	Dr. Sánta Róbert
DUEL-MUG-213	Metrology																10	0	5	F	5															DUEL-MUG-257 DUEL-IMA-110	Dr. Pór Gábor
DUEL-MUG-215	Machine Structures 3.																5	10	0	F	5															DUEL-MUG-214	Dr. Sánta Róbert
DUEL-MUA-210	Welding																5	5	5	F	5																Dr. Palotás Béla
DUEL-MUG-252	Production engineering																10	5	0	V	5															DUEL-MUG-257 DUEL-MUG-110	Dr. Vizi Gábor
DUEL-MUG-210	Machinery in general																10	0	5	F	5															DUEL-MUT-250	Dr. habil. Szlivka Ferenc
	Elective subject studies																5	10	0	V	5																
DUEL-MUG-151	Machinery																					10	5	0	V	5											DUEL-MUG-210	Dr. habil. Szlivka Ferenc
	A subject of specialisation (in semester 5.)																					30	5	25	V/F	20												
DUEL-ISR-117	Electric engines and drives																					10	5	0	V	5												Dr. Szabó István
DUEL-MUG-251	Machine Structures 4.																										10	5	0	V	5					DUEL-MUG-153 DUEL-MUG-215	Dr. Sánta Róbert
	A subject of specialisation (in semester 6.)																										20	10	30	V/F	20						
DUEL-MUG-253	Automatic Control																										5	10	0	V	5					DUEL-ISR-010 DUEL-IMA-110	Dr. Bajor Péter
DUEL-MUT-110	Environmental protection and energy management																															10	0	5	F	5		Dr. Kiss Endre
	Elective subject studies																															5	10	0	V/F	5		
DUEL-MUG-091	Thesis project																															0	45	0	A	15	fulfilling all of the subject semesters 1-6	Dr. habil. Szlivka Ferenc
DUEL-MUG-093	Professional Practice																															0	0	0	A	0		
DUEL-MUG-117	Quality Management																															10	5	0	F	5		Dr. Bajor Péter
Number of classes per semester		20	50	20		30	25	35	30		30	35	40	15		30	45	30	15		30	50	15	25		30	35	25	30		30	25	60	5		30		
Total Number of classes per semester		90					90					90					90					90					90					90						
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.		
DUEL-MUG-155	Basics of Mechatronics																					10	0	5	V	5										DUEL-MUG-211	Dr. Kővári Attila
DUEL-MUG-158	Sensors and Actuators																					10	0	5	V	5										DUEL-MUG-211	Dr. Nagy András
DUEL-MUG-114	Mechatronic systems 1.																					10	0	5	F	5										DUEL-MUG-211	Dr. Bajor Péter
DUEL-MUG-113	Mechatronic project 1.																					0	5	10	F	5										DUEL-MUG-211	Dr. Kővári Attila
DUEL-MUG-259	Electric drive technology																										10	5	0	V	5					DUEL-MUG-158 DUEL-ISR-117	Dr. Kővári Attila
DUEL-MUG-218	Mechatronics Systems Programming																										0	0	15	F	5					DUEL-MUG-155	Dr. Nagy András
DUEL-MUG-258	Mechatronic systems 2.																										10	0	5	V	5					DUEL-MUG-114	Dr. Nagy András
DUEL-MUG-217	Mechatronic project 2.																										0	5	10	F	5					DUEL-MUG-113	Dr. Kővári Attila
Per semester																						**30**	**5**	**25**		**20**	**20**	**10**	**30**		**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.		
DUEL-MUG-111	Production Planning, CAM																					10	0	5	F	5										DUEL-MUG-252	Dr. Vizi Gábor
DUEL-MUG-118	Tribology																					10	5	0	F	5										DUEL-MUT-250 DUEL-MUG-110	Dr. Szabó Attila
DUEL-MUG-157	Technical Diagnostics 1.																					10	5	0	V	5										DUEL-IMA-110 DUEL-MUG-153	Dr. Bajor Péter
DUEL-MUG-112	Maintenance Technologies 1.																					10	5	0	F	5										DUEL-MUG-252 DUEL-MUA-210	Dr. Szabó Attila
DUEL-MUG-256	Maintenance Technologies 2.																										10	5	0	V	5					DUEL-MUG-112	Dr. Szabó Attila
DUEL-MUG-219	Technical Diagnostics 2.																										10	0	5	F	5					DUEL-MUG-157 DUEL-MUG-151	Dr. Bajor Péter
DUEL-MUG-254	Maintenance Strategy																										10	5	0	V	5					DUEL-MUG-210 DUEL-MUG-251	Dr. Szabó Attila
DUEL-MUG-216	Complex machine design																										0	0	15	F	5						Dr. Vizi Gábor
Per semester																						**40**	**15**	**5**		**20**	**30**	**10**	**20**		**20**						

Subject descriptions

Engineering Physics

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Mérnöki Fizika</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">Engineering physics</td><td>Code</td><td>DUEN(L)-MUT-151</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5">-</td></tr>
<tr><td colspan="3">Number of Lessons</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 colspan="2">Full-time (Weekly)</td><td>1</td><td>1</td><td>1</td><td rowspan="2">F (practical mark)</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td>10</td><td>5</td><td>5</td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td>Name</td><td colspan="2">Dr. Miklós Horváth</td><td>Position</td><td>professor</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="5">- 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="4">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Seminar</td><td colspan="4">Flipchart, blackboard and other multimedia equipment, droup wor fir problem solving</td></tr>
<tr><td>Laboratory</td><td colspan="4">Labporatory excercises in the physics laboratory</td></tr>
<tr><td colspan="2" rowspan="3">Requirements</td><td colspan="5">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="5">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 parameters</td></tr>
<tr><td colspan="5">Attitude
– He is open to learning about and accepting knowledge related to physics 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="2">Brief description of the subject content</td><td colspan="5">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="5">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="5">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="5">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>
</table>

Hand-in Assignments/ measurement reports	alltogether 5 measuring reports on the laboratory excercises
Description of midterm tests	Midterm tests on weeks 7th and 13th.

Informatics

Subject name	In Hungarian	**Informatika**			Level	A
	In English	**Informatics**				DUEN(L)-ISR-010
Responsible educational unit		Institute of Informatics				
Name of Mandatory Preliminary Study		-				
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	0	0	3	F (Midterm mark)	5	English
Correspondence (Per semester)	0	0	15			
Teacher responsible for the course		Name	Dr. Mariann Várlajai		Position	College Professor
Educational goals		Basic ICT knowledge. Students competences at the end of the course: use of a graphical operating system, a word processor, creating worksheets, browsing the internet, writing emails, creating presentations.				
Typical delivery methods		Lecture				
		Seminar				
		Laboratory	In a classroom with the use of projector or computer in each seminar. Computer based exercises. PowerPoint presentations. Individual tasks.			
Requirements (expressed in learning outcomes/competencies to be acquired)		Knowledge Students get to know the required theoretical ICT knowledge and may use certain softwares as a semi-advanced user: operating system, MS Word, MS Excel, MS PowerPoint and Prezi.				
		Ability They are able to use the obtained skills even few years later, in real situations.				
		Attitude Strengthening the motivation for individual learning. Openness for new techniques and team work.				
		Autonomy and responsibility In professional questions, the students can play the role of using ICT tools for problem solving. They can tackle problems as responsible persons, i.e. in a certain situation, they can decide if there is a need to cooperate with others.				
Brief description of the subject content		Topics: - Operating systems in general, MS Windows (features, attributes, keyboard shortcuts, built-in applications, using zip files, file attributes/write-protected files) - MS Word (main attributes, using macros, typography) - MS Excel (most important functions, creating charts) - Creating presentations using Prezi and PowerPoint.				
Activity forms of students		Lectures, using the computer with teacher supervision (40%). Individual tasks (60%).				
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: 019515455x ISBN 13: 9780195154559 Available at the Library of the University.				
Recommended reading and its availability		Microsoft Office Official Tutorial and examples (available on the internet).				
Hand-in Assignments/ measurement reports						
Description of midterm tests		There will be 3 compulsory midterm tests. First test: MS Windows, Word, data protection, email. Second test: MS Excel. Third test: Presentation (Prezi and PowerPoint). All tests will be computer-based exercises. Duration: 60 minutes each.				

Entrepreneurship

Subject name	In Hungarian	**Vállalkozástan**			Level	A
	In English	**Entrepreneurship**			Code	DUEN(L)-TVV-122
Responsible educational unit		Institute for Social Sciences Department of Management and Enterprise Sciences				
Name of Mandatory Preliminary Study		-				
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Wekly)	1	2	0	CA (Continuous assessment)	5	English
Correspondence (Per semester)	5	10	0			
Teacher responsible for the course		Name	Dr. Andrea Keszi-Szeremlei		Position	College Teacher
Educational goals		The learning material gives board knowledge in entrepreneurial skills such as establishing, operating and transforming firms, handling their assets and financial issues. By the end of the course the students will be able to use their managerial, entrepreneurial and business legal knowledge in practice.				
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** Students will know the basic terms of entrepreneurship, understand the effect mechanisms of operating firms, know the legal background of companies, their internal and external environments, know the economic systems, aims and strategies of firms.				
		Ability Students will be able to use terms of this field professionally, to identify and determine the resources of companies, to understand the steps of company aims and strategies, to understand and use the relevant literature.				
		Attitude They are open and willing to discuss all points of the cases, as well as express their opinion, but without disclosing any important information about the circumstances of their own company. They have sensibility to find potentials for development.				
		Autonomy and responsibility Students feel responsibility for both their development and environment. They cooperate with each other. They have sensibility to find possible resolving opportunities for problems.				
Brief description of the subject content		The value chain and creation of double value both for buyers and suppliers. The technical and economic connections of value chain. The customer value and logistic buyer satisfaction. The customer value and the internet. The supply chain: system (network) of business relationships. The role of suppliers. Potential suppliers and the internet. Evaluation of suppliers, the criteria of supplier evaluation in internet. Strategic procurement. The methods and importance of demand anticipation in production logistics. Resource planning systems with buyer's cooperation. Management of customer relationship (CRM). The criteria of CRM systems (soft wares). The importance of services and its logistic problems. International transport. Competitiveness and supply chain management. Integration of supply chain. Measurement of supply chains. Tendencies in supply chain management.				
Activity forms of students		Case study analysis, Presentations, Individual work, Frontal class work, Essay writing				
Compulsory reading and its availability		William D. Bygrave - Andrew Zacharakis (2014): Entrepreneurship, 3rd Edition, John Wiley & Sons, DUE Library Materials on MOODLE				
Recommended reading and its availability		Jerome Katz, Richard Green (2014) Entrepreneurial Small Business. 4th ed. McGraw-Hill International Ed., ISBN: 978-0078029424, DUE Library				
Hand-in Assignments/ measurement reports		Processing and analysis of 1 chosen case study (On week 8th)				
Description of midterm tests		Midterm tests on weeks 7th and 12th. Supplementary test on week 13th.				

Economics 1.

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Közgazdaságtan 1.</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="4">Economics 1.</td><td>Code</td><td>DUEN(L)-TKT-151</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="6">Institute for Social Sciences
Department of Economics</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="2" rowspan="2">Requirements</td><td rowspan="2">Credits (ECTS)</td><td colspan="2" rowspan="2">Language of Education</td></tr>
<tr><td></td><td>Lecture</td><td>Seminar</td><td colspan="2">Laboratory</td></tr>
<tr><td>Full-time (Weekly)</td><td>1</td><td>2</td><td colspan="2">0</td><td rowspan="2">E
(Exam)</td><td rowspan="2">5</td><td colspan="2" rowspan="2">English</td></tr>
<tr><td>Correspondence (Per semester)</td><td>5</td><td>10</td><td></td><td>0</td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td>Name</td><td colspan="3">Dr.József Fogarasi</td><td>Position</td><td colspan="2">College Professor</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">This course is an introduction to economic concepts and basic economic theory. The course is split between the study of microeconomics, which focuses on the decision making of individual consumers and firms, and macroeconomics, with focuses on aggregate level economic questions such as interest rates, government spending, among others. Perhaps most important, this course will introduce you to the “economic way of thinking,” an approach to decision making that applies to personal decisions. It will: give you an idea of the range of behaviors that economists investigate, introduce you to the basic tools that we use to analyze the economy, and apply these tools to public policy issues.</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">In a classroom with the use of projector or computer in each seminar.</td></tr>
<tr><td>Laboratory</td><td colspan="5"></td></tr>
<tr><td colspan="2" rowspan="4">Requirements (expressed in learning outcomes/competencies to be acquired)</td><td colspan="6">Knowledge
Students as potential Economist know:
the types, terminology and main principles of Economics
basic concepts in Economics
the steps of analysis in Economics</td></tr>
<tr><td colspan="6">Ability
Students will be able to:
carry out basic analysis
formulate a synthetic relationship
carry out adequate evaluation activities</td></tr>
<tr><td colspan="6">Attitude
- Openness to authentic mediation and transmission of the overall mindset and the essential characteristics of practical operation of the profession.
- Desire for continuous self-education in the field of economics.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
In professional questions, the students can play the role of a decision-maker and are able to solve problems alone. They can tackle problems as responsible persons, i.e. in a certain situation, they can decide if there is a need to cooperate with others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="6">The science of economics. Introduction to economic thinking. Macro- and microeconomics. Positive and normative approach to economics. The basic concepts of economics. Coordination mechanisms in the economy. The market and its basic concepts. The operation of the market and price mechanisms. The market balance. The agents of mixed economy. The motivations, income and expenditures of household. The management of business organizations. Production factors and their markets. The concept of national economic performance, its most important statistical indicators. The concepts, conditions and measurement of economic growth. Economic development and sustainable growth. The concept and functions of money. The basic categories of the labor market. The state and the market economy. The role and functions of the government. Globalization, international trends and issues of the global economy.</td></tr>
<tr><td colspan="2">Activity forms of students</td><td colspan="6">Guided learning 17%
Individual learning 17%
Guided task completion 17%
Individual task completion 49%</td></tr>
<tr><td colspan="2">Compulsory reading and its availability</td><td colspan="6">Samuelson, Paul Anthony - Nordhaus, William D. Economics (2009) Mcgraw-Hill Publ.Comp.
Handouts from the lecturer
Materials on MOODLE</td></tr>
<tr><td colspan="2">Recommended reading and its availability</td><td colspan="6">Mankiw, Gregory Principles of Economics (2007) Sixth Edition, by Mason, Ohio: Thomson South-Western
Begg, D., S. Fischer and R. Dornbusch Economics (2002) -7th Edition- (McGraw- Hill)
Moffat, Mike: Online Microeconomics Textbook.</td></tr>
<tr><td colspan="2">Hand-in Assignments/ measurement reports</td><td colspan="6">Preparation and presentation of home assignments on pre-determined topics of micro and macroeconomics</td></tr>
<tr><td colspan="2">Description of midterm tests</td><td colspan="6">The test usually lasts for one hour and covers everything taught up to the date of test. The question paper will consist of multiple choice questions and short essay questions.</td></tr>
</table>

Mechanics 1.

<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="2">Institute:</td><td colspan="5">Institute of Engineering</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="3">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 (Weekly)</td><td>1</td><td>2</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>5</td><td>10</td><td>0</td></tr>
<tr><td colspan="2">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 colspan="2">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="5">• 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 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 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</td></tr>
</table>

	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. – 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 Engineers 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. Hibbeler: 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 bent 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 theoretical and practical parts. Students can earn ~30 points and ~70 points solving them. The total number of points is equal with the sum of the homework 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

Thermodynamics and Hydrodynamics

<table>
<tr><td rowspan="2">Title of subject:</td><td>In Hungarian:</td><td colspan="5">Hő- és áramlástan</td><td colspan="3" rowspan="2">Code: DUEN-MUT-250</td></tr>
<tr><td>In English:</td><td colspan="5">Thermodynamics and Hydrodynamics</td></tr>
<tr><td colspan="2">Responsible chair:</td><td colspan="8">Chair of Natural Sciences and Environmental Protection</td></tr>
<tr><td colspan="2">Prerequivisits:</td><td colspan="5">Engineering Physics</td><td colspan="3">Code: DFAN-MUT-151</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="3">Weekly load</td><td rowspan="2">Requirement</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 colspan="2">Full time (Weekly)</td><td>1</td><td>1</td><td>1</td><td rowspan="2">V</td><td rowspan="2">5</td><td colspan="2" rowspan="2">English</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td>5</td><td>5</td><td>5r</td></tr>
<tr><td colspan="2" rowspan="3">Responsible teacher</td><td>Name:</td><td colspan="3">Dr. Endre Kiss</td><td></td><td colspan="2">Professor</td></tr>
<tr><td>Tel:</td><td colspan="3">06 / 25 / 551 - 635</td><td>e-mail:</td><td colspan="2">kisse@uniduna.hu</td></tr>
<tr><td>Address:</td><td colspan="6">DF Műszaki Intézet, M ép. 20 szoba</td></tr>
<tr><td colspan="2" rowspan="3">Study types</td><td>Lecture:</td><td colspan="6">For every students, in a lecture theater, using projector</td></tr>
<tr><td>Practice:</td><td colspan="6">For every students, problem solving</td></tr>
<tr><td>Laboratory practice:</td><td colspan="6">In pairs, measurements in laboratory</td></tr>
<tr><td colspan="2">Purpose</td><td colspan="8">The study of the practical problems solution</td></tr>
<tr><td colspan="2">Short content</td><td colspan="8">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="8">– 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">Suggested literature</td><td colspan="8">–</td></tr>
<tr><td colspan="2">Description of tasks</td><td colspan="8">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="8">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

Subject name	In Hungarian	**CAD**			Level	A
	In English	**CAD**			Code	DUEN(L)-MUG-212
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 (Weekly)	0	0	3	F (practical mark)	5	English
Correspondence (Per semester)						
Teacher responsible for the course		Name	Dr. Gábor Vizi		Position	assoc. prof.
Educational goals		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.				
Typical delivery methods		Lecture	-			
		Seminar	-			
		Laboratory	In a classroom with using of PC and simulator software on each practice.			
Requirements		**Knowledge** – Gets acquainted with the principles and methods of machine design and machine manufacturing technology procedures based on CAD aspects.				
		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				
		Attitude - He is open to learning about and accepting knowledge related to designing related to his / her qualification or field. Interested in new methods and tools related to the field.				
		Autonomy and responsibility Taking responsibility for personal work and the work with others.				
Brief description of the subject content		Features of parametric modelling systems. Basic concepts. Parametric geometric models, associativity, features as building blocks, sketches, geometric relations etc. Pre-requisites 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.				
Activity forms of students		Designing processes of workpieces using simulator software				
Compulsory reading and its availability		SolidWorks Online Help And Tutorial				
Recommended reading and its availability		-1. Descriptions and documentations related to SolidWorks.				
Hand-in Assignments/ measurement reports		-				
Description of midterm tests		3D modell making from significant part by student and generating drawings during dedicated time to corresponde of rules of drawing directions.				

Chemistry and Materials Science

The name of subject	In Hungarian	**Kémia és Anyagismeret**			Level	A
	in English	**Chemistry and Materials Science**				DUEN(L)-MUA-211
Responsible department		Materials Science Department				
Prerequisites:		None				
Types	Number of lectures per semester:			Requirement	Credit	Language of education
	Lectures	Problem solving	Labs			
	1	0	2	V	5	English
Responsible teacher:		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 exercises 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	

Machine Structures 1.

Subject name	In Hungarian	**Gépszerkezettan 1.**		Level	A
	In English	**Machine Structures 1.**		Code:	DUEN(L)-MUG-214
Subject code					
Responsible educational unit		Institute of Engineering			
Name of Mandatory Preliminary Study		-			

Number of lessons per week				Requirements	Credit (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	1	2	0	F (practical mark)	5	English
Correspondence (Per semester)	5	10	0			

Teacher responsible for the course	Name:	Dr. Robert Sánta	position:	associate professor

Purpose of the subject (content, outcome, place in the curriculum)	The student should be able to perform any variation of the basic editions that occur in the representational geometry. Recognize the elementary edits needed to solve various complex tasks, be able to determine their proper order. You can choose the optimal solution for your situation from the possible solutions. The student should know the theory and practice of training technical drawing projections and sections. The student should be able to edit technical drawings of machine parts with traditional tools, read technical drawings. The student should be able to build a dimensional network of machine parts.	
Typical lesson types	Lecture:	In a classroom with the use of projector, Power Point and computer in each lecture.
	Seminar:	Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work max. 25 students.
	Laboratory	-
	Other:	-

Requirements
(in learning outcomes)

Knowledge

- Knows the conceptual system related to his/her field of expertise, the most important contexts and theories.
- Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of his/her field.
- Basic knowledge of machine design principles and methods, machine building technology, control engineering procedures and operating processes.
- Comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices.
- Can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and connection of the applied system elements

Ability

- He performs a work that matches his qualifications.
- 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 (using practical operations in practice).

Attitude

- Strives to learning about and accepting machine design developments related to his qualification and field of expertise. Interested in new methods and tools related to the field.

Autonomy and responsibility:

- Responsibility for one's own work and the work of others.

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	- Processing of theoretical material with control 20% Independent processing of theoretical material 20% Problem solution with control 20% Independent processing of tasks 40% Laboratory measurements with control - Preparation of 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

Mechanics 2.

<table>
<tr><td colspan="2">Title of subject:</td><td>Hungarian
English:</td><td colspan="3">Mechanika 2.
Mechanics 2.</td><td>Code:</td><td colspan="2">DUEN(L)-MUG-257</td></tr>
<tr><td colspan="5">Institute:</td><td colspan="5">University of Dunaújváros</td></tr>
<tr><td colspan="5">Compulsory pre-subject:</td><td colspan="3">Mechanics 1.</td><td>Code:</td><td>DUEN(L)-MUG-152-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="2" rowspan="2">Number of lessons per week
Lecture</td><td colspan="2" rowspan="2">Seminar</td><td colspan="2" rowspan="2">Practice/Laboratory</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr></tr>
<tr><td colspan="2">Full-time (Weekly)</td><td colspan="2">1</td><td colspan="2">2</td><td colspan="2">0</td><td rowspan="2">semester grade</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td colspan="2">Part-time</td><td colspan="2">5</td><td colspan="2">10</td><td colspan="2">0</td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td colspan="2">name:</td><td colspan="3">Dr. Zachár András</td><td>position:</td><td>professor</td></tr>
<tr><td colspan="3">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="8">• 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 colspan="3" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="7">Lecture using projector.</td></tr>
<tr><td>Seminar:</td><td colspan="7">Using projector and additional materials.</td></tr>
<tr><td>Laboratory</td><td colspan="7">-</td></tr>
<tr><td>Other:</td><td colspan="7">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="8">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.
– 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.</td></tr>
<tr><td colspan="3">Short description of subject content</td><td colspan="8">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.</td></tr>
</table>

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 Engineers 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. Hibbeler: 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

Management

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Menedzsment</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">Management</td><td>Code</td><td>DUEN(L)-TVV-114</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute for Social Sciences
Department of Management and Enterprise Sciences</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5"></td></tr>
<tr><td colspan="2">Number of Lessons</td><td colspan="2" rowspan="2"></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 (Weekly)</td><td>1</td><td>2</td><td>-</td><td rowspan="2">CA (Continuous assessment)</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Correspondence (Per semester)</td><td>5</td><td>10</td><td>-</td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td>Name</td><td colspan="2">Dr. habil Mónika Rajcsányi-Molnár</td><td>Position</td><td>College Teacher</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="5">The module provides a comprehensive understanding of management in theory and in practice. The course is designed to familiarize students with the most important information for the management of labor organizations, to provide insight into the "special" management dimensions, and those determinants.</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td>Lecture</td><td colspan="4">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Seminar</td><td colspan="4">In a classroom with the use of projector or computer in each seminar.</td></tr>
<tr><td>Laboratory</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="4">Requirements</td><td colspan="5">Knowledge
Students as potential manager:
Familiar with the fundamental aspects of science organization, the most important concepts, requirements, relationships and procedures.
It learns supply management tasks, theoretical and methodological foundations of the exercise of the functions.
Familiar with the planning, organization and management frequently used procedures and methods.
Familiar with the leadership style models and understand their role in effective leadership behavior.</td></tr>
<tr><td colspan="5">Ability
Students will be able to:
analyse and develop the management and decision making mechanisms of work organizations
effectively organize individual and team work
identify and solve problems
integrate knowledge
recognize and evaluate alternatives
handle operative planning tasks
work in groups
accept divergent views
manage time
select and focus on various tasks
identify, understand and apply different leadership styles
understand and manage organizational processes</td></tr>
<tr><td colspan="5">Attitude
Open to accommodate new innovative approaches.
Avoids the stereotypes.
Not think schemas.
Susceptible development opportunities for exploitation.
Good, future-oriented bargainers respect their counterpart, are trustworthy and not aggressive. They are open and willing to discuss all points of the negotiation process, as well as express their opinion, but without disclosing any important information about the circumstances of their own company.</td></tr>
<tr><td colspan="5">Autonomy and responsibility
In professional questions negotiators can play the role of a decision-maker and are able to solve problems alone. They can tackle problems as responsible persons, i.e. can decide if it is a need in a certain negotiation phase or situation to cooperate with others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="5">Interpretation and origin of management. The role and importance of management in the governance of companies.
Historical overview of management studies: concepts, schools, trends; similarities and differences.
Practicing management functions:
- Planning: vision of the future, goal hierarchy, short term and operative planning, planning methods.
- Organizing: changing the structure, processes, defining organizations, division of labor, developing processes and organizational structures, structural differences of organizations, organization types and characteristics.
- Control: changing conditions, exercise authority, define norms, measurement, evaluation and adjusting, managing everyday problems.</td></tr>
</table>

	- Coordinating: harmonizing goals-processes-organization, coordination tools, operation control, task-authority-responsibility fit, control processes of organizations: rules of organization and operation, professional rules and regulations, job description. - Leadership: leadership effectiveness, leadership styles: characteristics, decision making theories, behavioral theories, contingency-approach. Organizational culture and strategy. Components and dimensions of culture. Understanding and analyzing cultural differences. Managing corporate culture.
Activity forms of students	Frontal work: 30 % Individual presentation 20% Group work: 35% Test: 15%
Compulsory reading and its availability	Williams-DuBrin-Sisk (1995):Management & Organization, South-Western Publishing Co. Cincinnati, Ohio, USA Materials on Moodle
Recommended reading and its availability	Chelsom-Payne-Reavill (2005): Management for Engineers, Scientists and Technologists, John Wiley& sons, Ltd, England
Hand-in Assignments/ measurement reports	Case study analysis Group work Individual presentation: An organization working goal, process and organizational structure These tasks cannot be replaced during the exams.
Description of midterm tests	Test

Technology of Structural Materials

Subject name		**In Hungarian**		**Szerkezeti anyagok technológiája**					Szintje	BSc	
		In English		**Technology of Structural Materials**					Level	BSc	
Subject code				DUEN-MUA-116, DUEL-MUA-116							
Responsible educational unit				Institute of Technology Department of Materials Science							
Name of Mandatory Preliminary Study				Chemistry and materials Science							
Number of Lessons								**Requirements**	**Credits (ECTS)**	**Language of Education**	
		Lecture		**Seminar**		**Laboratory**					
Full-time	150/52		2		0		2	Mid-term mark	5	**English**	
Correspondence	150/18		5		0		13				
Teacher responsible for the course				**Name**		Dr. Zsolt Csepeli			**Position**	college professor	
Educational goals				This course will enable students to be familiar with the structure, prop-erties and application of the most important structural materials (steels, cast irons, aluminium and aluminium alloys). Students will learn the basics of the most important shape giving technologies (casting, plastic deformation) and the property changing technologies (alloying, heat treating, surface treating). The course will also give an introduction to melting and forming technologies of the most important metallic and non-metallic structural materials, as well as the most important welding technologies and their application.							
Typical delivery methods				**Lecture**	Lectures with Powerpoint presentations.						
				Seminar							
				Laboratory	Problem solving and laboratory practice.						
Requirements (expressed in learning outcomes/competencies to be acquired)				**Knowledge** • Students have some knowledge of the basic material microstructures and properties, and are familiar with the most frequently used material testing methods.							
				Ability • Students are able to evaluate the information related to material processing, and are able to define the appropriate questions.							
				Attitude • Try to apply state-of-the-art knowledge to select the appropriate processing technology.							
				Autonomy and responsibility • Can work independently and takes responsibility. Cooperates with experts from other fields to solve the revealed problems but can make their own decisions.							
Brief description of the subject content				Properties of structural materials. 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. Powder metallurgy. Classification of ferrous and nonferrous materials.							
Activity forms of students				Understanding and assimilation of the topics of presentations 50% Testing of materials 30% Laboratory exercises 20%							
Compulsory reading and its availability				[1] J. T. Black, Ronald A. Kohser: DeGarmo's Materials and Processes in Manufacturing, Wiley [2] William D. Callister: Materials Science and Engineering, An Introduction, 2007, Wiley [3] www.steeluniversity.com [4] www.alumatter.info							
Recommended reading and its availability				[5] ASM Metals Handbook Desk Edition 2001 [6] ASM Metals Handbook Volume 14 - Forming And Forging [7] core.materials.ac.uk [8] moodle.uniduna.hu							
Hand-in Assignments/ measurement reports				Students have to prepare and present a 10-15 minutes oral presentation. Two laboratory reports should be prepared.							
Description of midterm tests											

Machine Structures 2.

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Gépszerkezettan 2.</td><td>Level:</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">Machine Structures 2.</td><td>Code</td><td>DUEN(L)-MUG-110</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5">DUE(L)-MUG-152 Mechanics 1.
DUEN(L)-MUG-212 CAD
DUEN(L)-MUG-214 Machine structures 1.</td></tr>
<tr><td colspan="2" rowspan="2">Number of Lessons</td><td>Lecture</td><td>Seminar</td><td>Laboratory</td><td rowspan="2">Requirements</td><td>Credit (ECTS)</td><td>Language of Education</td></tr>
<tr><td>Full-time (Weekly)</td><td>2</td><td>1</td><td>0</td><td rowspan="2">F (practical mark)</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Correspondence (Per semester)</td><td>10</td><td>5</td><td>0</td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td colspan="2">Name</td><td colspan="2">Dr. Robert Sánta</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">The student should know the structure and operation of the typical machine parts, machine elements, assemblies, subassemblies occurring in mechanical practice. Be able to select standard components for such units, determine major dimensions, and construct related components. Be able to prepare drawing documentation for units using traditional and computer tools. The student can apply what he / she learned in Mechanical Engineering I, CAD and Mechanics I to edit simple constructions and components.</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, Power point 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 max. 25 students.</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 subject of the technical field.
– Knows the conceptual system, the most important connections and theories related to his / her field.
– Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of his / her field.
– Basic knowledge of machine design principles and methods, machine building technology, control engineering procedures and operating processes.
– Comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices.
– 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.
– Can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and connection of the applied system elements.
– Can apply the related calculation and modeling principles and methods of mechanical product, process and technology design.
Ability
- Carries out a job that matches your qualifications.
- 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 (using practical operations in practice).
- Ability to create basic models of technical systems and processes.
- Routine identifies professional problems, explores and formulates the theoretical and practical background needed to solve them, solves them with the practical application of standard operations.
Attitude
– Seeks to learning about and accepting knowledge related to mechanical engineering related to his qualification and field of expertise. Interested in new methods and tools related to the field.

Autonomy and responsibility:
– Able responsibility for one's own work and the work of others.</td></tr>
<tr><td colspan="2">Short description of subject content</td><td colspan="6">Parts or units of machine equipment with a similar structure and repetitive role, performing the same task - machine parts. Conceptual definition, grouping, description, representation, strength sizing, correct structural design, operation and maintenance of machine elements. The main machine elements to be discussed in detail resp. groups: drive and tie bolts, shafts, shaft couplings, couplings, bearings, belt drives, gears. During the discussion of the topics, the emphasis is on the representation and overview of the components / units.</td></tr>
<tr><td colspan="2">Forms of student activity</td><td colspan="6">- Processing of theoretical material with control 20% Independent processing of theoretical material 20% Task solution with control 20% Independent processing of tasks 40%</td></tr>
</table>

	Laboratory measurements with control - Preparation of laboratory protocols
Compulsory literature	- Materials on MOODLE
Optional literature	- Robert L. Norton: Machine Design - An Integrated Approach, 2006, Pearson Prentice Hall Upper Saddle River NJ. - Franz Koenigsberger, Machine tool structure,ISBN 10: 008013405X

Mechanics 3.

Subject name	In Hungarian	**Mechanika 3.**		Level:	A
	In English	**Mechanics 3.**		Code:	DUEN(L)-MUG-153
Subject code					
Responsible educational unit		Institute of Engineering			
Name of Mandatory Preliminary Study		DUEN-MUG-152 Mechanics 1.			

Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time	1	2	0	V	5	English
Correspondence (Per semester)	5	10	0			

Teacher responsible for the course	Name	Dr. Robert Santa	position:	associate professor

Purpose of the subject (content, outcome, place in the curriculum)	The student learns to define the kinetic and kinematic characteristics of material points, rigid bodies and simple mechanisms by applying the concepts and contexts of the lectures in practice and during home preparation. Gains knowledge about the classification and operation of mechanisms that often occur in mechanical engineering. Gain knowledge of the impact and oscillation phenomena of elastic bodies.	
Typical lesson types	Lecture:	In a big classroom with the use of projector or computer in each lecture.
	Seminar:	Small classroom board for up to 25 people, sketching, editing, calculation exercises
	Laboratory	-
	Other:	-
Requirements (in learning outcomes)	**Knowledge** - Knows the general and specific mathematical, natural and social science principles, rules, connections and procedures required for cultivating the technical field. - Knows the conceptual system, the most important connections and theories related to his / her field. – Comprehensively knows the methods of acquiring knowledge and problem solving of the main theories of his / her field. **Ability** – 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 (using practical operations in practice). – Ability to create basic models of technical systems and processes. **Attitude** - Seeks to learning about and accepting knowledge related to mechanical engineering related to his qualification and field of expertise. 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	
Short description of subject content	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).	
Forms of student activity	- Processing of theoretical material with control / independently: 15/35% Problem solution with control / independently: 20/29% Laboratory measurements with control: 1%.	
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	

Metrology

Subject name	In Hungarian	**Metrológia**							Level	A	
	In English	**Metrology**							Code	DUEN(L)-MUG-213	
Subject code											
Responsible educational unit		Institute of Engineering									
Name of Mandatory Preliminary Study		DUEN-MUG-257, DUEN-IMA-110									
Number of Lessons								Requirements	Credits (ECTS)	Language of Education	
	Lecture		Seminar		Laboratory						
Full-time (Weekly)		2		1				F (practical mark)	5	Hungarian	
Correspondence (Per semester)		10		5							
Teacher responsible for the course		Name		Dr. Gabor PÓR					Position	prof. emeritus	
Educational goals		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.									
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** – Gets acquainted with the principles and methods of metrology. – Has a comprehensive knowledge of the metrological calculation estimation fof bias and standard error t									
		Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to calculate, plan measurement, report, estimating necessary formulae s									
		Attitude – He/she is open to learning about and accepting knowledge related to metrology 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		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.									
Activity forms of students		Case study analysis, Presentations, Individual work, Frontal class work, Essay writing									
Compulsory reading and its availability		Materials on MOODLE GUM (Guide ot Uncertainty of Measurement									
Recommended reading and its availability		VIM									
Hand-in Assignments/ measurement reports		Compiling measurement report									
Description of midterm tests		Midterm tests on week 12th.									

Subject name	In Hungarian	Gépszerkezettan 3.			Level	A	
	In English	Machine structures 3.			Code	DUEN(L)-MUG-215	
Subject code							
Responsible educational unit		Institute of Engineering					
Name of Mandatory Preliminary Study		DUEN MUG-214 Machine structures 1.					
Number of Lessons					Requirements	Credits (ECTS)	Language of Education
		Lecture	Seminar	Laboratory			
Full-time (Weekly)		1	2	0	F (practical mark)	5	English
Correspondence (Per semester)		5	10	0			
Teacher responsible for the course		Name	Dr. Robert Sánta		position:	associate professor	

Purpose of the subject (content, outcome, place in the curriculum)	The student must learn how to solve those descriptive geometrical 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 occurring in the mechanical engineering practical work. The student must be familiar with creating complex forms occurring 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-dependent 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.	
Typical lesson types	Lecture:	In a big 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. Max.25 students.
	Laboratory	
	Other:	-
Requirements (in learning outcomes)	**Knowledge** – Knows the conceptual system, the most important connections and theories related to his / her field. – Comprehensive knowledge of the methods of acquiring knowledge and problem solving of the main theories of his / her field. – Basic knowledge of machine design principles and methods, machine building technology, control engineering procedures and operating processes. – Comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices. – Can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and connection of the applied system elements. – Can apply the related calculation and modeling principles and methods of mechanical product, process and technology design. **Ability** - Carries out a job that matches your qualifications. - 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 (using practical operations in practice). **Attitude** – Seeks to learning about and accepting knowledge related to mechanical engineering related to his qualification and field of expertise. 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.	
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 theoretical material with control 20%. Independent processing of theoretical material 20%. Problem solution with control 20%. Independent processing of tasks 40%. Laboratory measurements with control - Preparation of 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

Production Engineering

Subject name	In Hungarian	**Gyártástechnológia**		Level	A
	In English	**Production Engineering**		Code	DUEN(L)-MUG-252
Subject code					
Responsible educational unit		Institute of Engineering			
Name of Mandatory Preliminary Study		DUEN-MUG-110 Machine structures 1. DUEN-MUG-257Mechanics 2.			
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	2	2	1	F (practical mark)	5	English
Correspondence (Per semester)						
Teacher responsible for the course	Name	Dr. Gabor Vizi		Position	assoc. prof.	
Educational goals	To understand and learn the principles of production technology. Fabrication,theoretical principles of moulding, moulding and pressing technologies, machines and tools of it. Tube making. Cutting. To understand and learn the principles and consequence of cutting. Cutting processes. Calculations of technological parameters and selection, tool life and wear, main machining time and determination of costs. Other cutting procedures.				
Typical delivery methods	Lecture	In a classroom with using of projector and computer for every students			
	Seminar	In a classroom with using of projector and computer for every students			
	Laboratory	In a classroom with using of projector and computer for every students			
Requirements	**Knowledge** – Gets acquainted with the principles and methods of machine manufacturing technology procedures.				
	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				
	Attitude – He is open to learning about and accepting knowledge related to designing related to his / her qualification or field. Interested in new methods and tools related to the field.				
	Autonomy and responsibility Taking responsibility for personal work and the work with others.				
Brief description of the subject content	Cutting technologies Version of manufacturing technologies and features of cutting. Turning, planning, drilling, milling, grinding. Optimizing of cycles feed and allowance in every manufacturing processes. Calculations of main cutting time. Chooseing of suitable machinetool. Calculations of normal cutting time. Cost analisys. Non conventional cutting procedures (broaching, sawing, gearing, etc.,). Determinations of stock dimensions. Calculation of allowance. Dimension chain calculations. Non cutting (plastic deformation) technologies Deeper knowing of theoretical backround of non cutting procedures. Theoretical basics of metal forming. Grouping of non cutting proccesses. Technology of moulding, procedures and it's manufacturing equipments. Technologies of forging and pressing and rolling it's manufacturing equipment and tools. Seamless tube manufacturing and technology and machinetools. Sheet forming technologies. Punching and cutting technology, machines and tools. Bending technology, machines and tools. Theory of deep drawing technology and tools. Processes of cold forming and cold extrusion and it's tools and machines.				
Activity forms of students	Individual calculations and performances on board				
Compulsory reading and its availability	Materials on MOODLE				
Recommended 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				
Hand-in Assignments/ measurement reports	-				
Description of midterm tests	During the semester, there are two compulsory tests: one on the 7th week, the second on the 13th week of the semester				

Machinery in General

Name of the subject	In Hungarian	**Általános géptan**		Level	A
	In English	**Machinery in General**		Code	DUEN(L)-MUG-210
Responsible Education Unit		Institute of Technology			
Mandatory pre-study name		DUEN(L)-MUT-250 Heat and Flow Dynamics			

Type	Hours per week			Requirement	Credits	Language of education
	Lecture	Practice	Lab			
Full-time (Weekly)	2	0	1	Practice note	5	English
Correspondence (Per semester)	10	0	5			

Subject Officer	Name	Dr. habil. Ferenc Szlivka	Status	Professor

Training purpose and justification of the course (content, output, curriculum space)	**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.	
Typical transfer methods	Performance	For all the students in high-performance, board performance. Projector, use (67% of total hours)(26 hours)
	Practice	
	Lab	Manual editing practice in groups of up to 30 people. (33% of total hours) (1 p.m.)
	Other	
Requirements (expressed in academic results)	**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.	
	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.	
	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.	
	Autonomy and responsibility Taking responsibility for his own work and the work of his peers.	
A brief description of the content of a subject	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.	
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%	

	○ 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 planting I. - National Textbook Publisher, 1998. Budapest - Pattantyús Á. Géza: Machine planting - Technical Publisher, 1983. Budapest

Machinery

Name of the subject	In Hungarian	**Géptan**		Level	A
	In English	**Machinery**		Code	**DUEN(L)-MUG-151**
Responsible Education Unit		Institute of Technology			
Mandatory pre-study name		DUEN(L)-MUG-210 Machinery in General			

Type	Hours per week			Requirement	Credits	Language of education
	Lecture	Practice	Lab			
Full-time (Weekly)	2	1	0	Examination	5	English
Correspondence (Per semester)	10	5	0			

Subject Officer	Name	Dr. habil. Ferenc Szlivka	Status	Professor

Training purpose and justification of the course (content, output, curriculum space)	**Goals, development objectives** ○ He is fully familiar with the basic facts, directions and boundaries of the field of technical expertise. ○ You are familiar with the concept system in your field, the most important contexts and theories. ○ He is fully familiar with the operational principles and structural components of the work and power equipment, mechanical equipment, equipment and equipment used. ○ 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.

Typical transfer methods	Lecture	For all the students in high-performance, board performance. Projector, use (67% of total hours)(26 hours)
	Practice	Manual editing practice in groups of up to 30 people. (28% of total hours) (10 a.m.)
	Lab	(5% of all hours 3 hours demonstration lab
	Other	

Requirements (expressed in academic results)	**Knowledge** ○ You are familiar with the concept system in your field, the most important contexts and theories. ○ He is fully familiar with the methods of acquiring knowledge and problem solving the main theories of his field. ○ You are fundamentally familiar with machine design principles and methods, mechanical engineering, control technology processes and operational processes. ○ He is fully familiar with the operational principles and structural components of the work and power equipment, mechanical equipment, equipment and equipment used. ○ 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. ○ Apply the related calculation, modelling principles and methods of mechanical product, process and technological design.
	Ability ○ Performs a job appropriate to your qualifications. ○ Capable of designing, organising and performing self-study. ○ Capable of producing a particular machine unit or a component capable of replacing it on the basis of the finished drawing.
	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.
	Autonomy and responsibility Taking responsibility for his own work and the work of his peers.
A brief description of the content of a subject	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
Student activities	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
Mandatory literature and availability	- MOODLE Szlivka Ferenc PPT electronic curriculum DUE - Ferenc Szlivka: Flow Machines note, Dunaújváros College 2008 - 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

Machine Structures 4.

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Gépszerkezettan 4.</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">Machine Structures 4.</td><td>Code</td><td>DUEN(L)-MUG-251</td></tr>
<tr><td colspan="7">Subject code</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5">DUEN-MUG-153, Mehanics 3., DUEN-MUG-215 Machine structures 3.</td></tr>
<tr><td colspan="2" rowspan="2">Number of Lessons</td><td colspan="3" rowspan="2"></td><td rowspan="2">Requirements</td><td>Credits (ECTS)</td><td rowspan="2">Language of Education</td></tr>
<tr><td>Lecture</td><td>Seminar</td><td>Laboratory</td><td></td></tr>
<tr><td colspan="2">Full-time (Weekly)</td><td>2</td><td>1</td><td>0</td><td rowspan="2">V</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td>10</td><td>5</td><td>0</td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td colspan="2">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="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="2" rowspan="4">In a classroom with the use of projector or computer in each lecture.</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, max 25 students.</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 / 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 learning about and accepting knowledge related to mechanical engineering related to his qualification and field of expertise. 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="2">Short description of subject content</td><td colspan="6">Typical surfaces and bodies of mechanical practice. Flat section of planar bodies. Plane section of curved bodies. Influence of planar bodies. Influence of curved bodies. The ISO tolerance system. Length tolerances. Joints. Surface quality metrics and how to prescribe them. Typical design of cast, welded and machined parts. Reconstruction of machine parts (reverse engineering).</td></tr>
<tr><td colspan="2">Forms of student activity</td><td colspan="6">- 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 %</td></tr>
<tr><td colspan="2">Compulsory literature</td><td colspan="6">- Materials on MOODLE</td></tr>
<tr><td colspan="2">Optional literature</td><td colspan="6">- Robert L. Norton: Machne Design - An Integrated Approach, 2006, Pearson Prentice Hall Upper Saddle River NJ.
- Franz Koenigsberger, Machine tool structure,ISBN 10: 008013405X</td></tr>
</table>

Automatic Control

Subject name	In Hungarian	**Irányítástechnika**		Level	A
	In English	**Automatic Control**		Code	DUEN(L)-MUG-253
Responsible educational unit		Institute of Engineering			
Name of Mandatory Preliminary Study		DUEN(L)- IMA-100 Mathematics 3. DUEN(L)-ISR-010 Informatics			
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	1	1	1	V (Exam)	5	English
Correspondence (Per semester)	5	5	5			
Teacher responsible for the course	Name		Peter Bajor, PhD		Position	assoc. prof.
Educational goals	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.					
Typical delivery methods	Lecture	In a classroom with the use of projector or computer in each lecture.				
	Seminar	Seminars in computerized classrooms				
	Laboratory	Using assembly tables and programming computers.				
Requirements	**Knowledge** – Knows the conceptual frameworks, the most important connections and theories related to his / her field. – Knows the principles and methods of machine design, machine building technology, control procedures and operating processes. – Can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and connection of the applied system elements.					
	Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to create basic models of technical systems and processes.					
	Attitude – He/She is open to learning about and accepting knowledge related to control and automation 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	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.					
Activity forms of students	Processing of heard text with notes 20% Organizing information with a task 15% Solving a test task 10% Individual preparation 35% Independent processing of tasks 20%					
Compulsory reading and its availability	Materials on MOODLE					
Recommended reading and its availability	Dorf and Bishop (2011): Modern Control Systems, 12th Edition, Prentice Hall (Pearson) Nise (2011): Control Systems Engineering, 6th Edition, Wiley					
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.					

Environmental Protection and Economical use of Energy

<table>
<tr><td rowspan="2">Name of the course</td><td>In Hungarian</td><td colspan="3">Környezetvédelem és energiagazdálkodás</td><td colspan="3" rowspan="2">Code: DUEN-MUT-110</td></tr>
<tr><td>In English</td><td colspan="3">Environmental Protection and Economical use of Energy</td></tr>
<tr><td colspan="2">Department in charge:</td><td colspan="6">Természettudományi és Környezetvédelmi Tanszék
Chair of Natural Sciences and Environmental Protection</td></tr>
<tr><td colspan="2">Pre-requivisits:</td><td colspan="4">-</td><td colspan="3">code: -</td></tr>
<tr><td rowspan="2">Type</td><td colspan="3">Hours per week</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td colspan="2" rowspan="2">Language of education</td></tr>
<tr><td>Lecture</td><td>Seminar</td><td>Laboratory practice</td></tr>
<tr><td>Full time (Weekly)</td><td>2</td><td>-</td><td>5 h/ Semester</td><td rowspan="2">F (Cotinuous evaluation)</td><td rowspan="2">5</td><td colspan="2" rowspan="2">English</td></tr>
<tr><td>Part time(Per semester)</td><td>4</td><td>-</td><td>6h</td></tr>
<tr><td colspan="2" rowspan="3">Professor in charge</td><td>Name:</td><td colspan="2">Dr. Endre Kiss</td><td>Position:</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 Természettudományi és Környezetvédelmi Tanszék, Bldg. C1. Room C114</td></tr>
<tr><td colspan="2" rowspan="3">Methods of delivery</td><td>Presentation:</td><td colspan="5">Presentation in a lecture room for everyone using computer driven projector</td></tr>
<tr><td>Seminars:</td><td colspan="5">Seminar with presentation by students (max 30 students)</td></tr>
<tr><td>Lab.:</td><td colspan="5">Measurement in laboratory in pairs (max 11 pairs)</td></tr>
<tr><td colspan="2">Aim of education</td><td colspan="6">The students get acquinted with the subject and the general problems of environmental protection, the technologies of abatement and elimination of pollutant’s.</td></tr>
<tr><td colspan="2">Summary of the course content</td><td colspan="6">Basics of ecology. The subject, the questions, and purpose of environmental protection. The biological and geological environment. Cycles. The gas cover of Earth. The most important pollutants of air. The properties of dust pollution in the air. The general properties 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. Powders with low and high electric resistance. The parts of electrostatic precipitators. Bag filter with electrostatic charging and their applications. Electrostatic precipitation with pulse energisation, abatement and decomposition of gases. Adsorption and absorption processes. Scrabbers. Oxidation methods. Burning technologies. Odor abatement. The measurement of air pollution. The properties of the natural waters, and their pollution, self cleaning. Water treatment technologies and their equipments. The pollution of soil. Waste and their treatment. Noise and vibration as environmental protection. Radioactive pollution.</td></tr>
<tr><td colspan="2">Literature (compulsory)</td><td colspan="6">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</td></tr>
<tr><td colspan="2">Literature (suggested)</td><td colspan="6">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</td></tr>
<tr><td colspan="2">Compulsory Laboratory reports</td><td colspan="6">At least 5 per semester</td></tr>
<tr><td colspan="2">Tests</td><td colspan="6">On the 6th and the 13th week. Containing assay type parts.</td></tr>
<tr><td colspan="2">The condition and development of the mid-term grade</td><td colspan="6">In case of more than 25% absence from the lectures and seminars, as well as from laboratory practices, and if the average of the midsemester tests is less then 51%, the evaluation mark is 1 (unsuccessful), and similarly, if one or more of the reports on laboratory practices is missing, or evaluated less then 2, the evaluation is also 1. It is possible to rewrite one of the tests once, and to remake the measurements also once per kinds. If this evaluation is less than 2, the student can come for oral examination, if he or she likes to pass.

If the students test result is greater than 51 point in average, and gave all of the 5 presentations successfully, and all of the 5 laboratory reports are evaluated by more than 2, then the evaluation mark is</td></tr>
</table>

$$evaluation\ mark = \frac{2 \cdot AT + 2 \cdot AS + 2 \cdot ALR + OPEA}{7}.$$

The examination is oral, and it is also imperatory for the pass to reach at least 2..
The final evaluation mark is calculated according to the form below:

$$evaluation\ mark = \frac{4 \cdot RE + 2 \cdot AT + 2 \cdot AS + 2 \cdot ALR + OPEA}{11}$$

Legend:
RE: result os oral exam
AT: average of tests
AS: average of the evaluations of seminar presentations
ALR: average of lab report
OPEA: other points for extra activities

The evaluation:

0-50%	unacceptable
51-60%	acceptable
61-70%	average
71-80%	good
80%-	excellent

BSc Thesis

<table>
<tr><td rowspan="2">Name of the subject</td><td>In Hungarian</td><td colspan="3">Szakdolgozat</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">BSc Thesis</td><td>Code</td><td>DUEN(L)-MUG-091</td></tr>
<tr><td colspan="2">Responsible Education Unit</td><td colspan="5">Institute of Technology</td></tr>
<tr><td colspan="2">Mandatory pre-study name</td><td colspan="5">1-6 semesters for all subjects</td></tr>
<tr><td rowspan="2">Type</td><td colspan="3">Hours per week</td><td rowspan="2">Requirement</td><td rowspan="2">Credits</td><td rowspan="2">Language of education</td></tr>
<tr><td>Performance</td><td>Practice</td><td>Lab</td></tr>
<tr><td colspan="2">Full-time (Weekly)</td><td></td><td>9</td><td></td><td rowspan="2">Signature</td><td rowspan="2">15</td><td rowspan="2">English</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td></td><td>45</td><td></td></tr>
<tr><td colspan="2">Subject Officer</td><td colspan="2">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
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.</td></tr>
<tr><td colspan="2" rowspan="4">Typical transfer methods</td><td colspan="2">Performance</td><td colspan="4"></td></tr>
<tr><td colspan="2">Practice</td><td colspan="4">The student prepares his thesis independently in 100% of the practice during individual consultations.</td></tr>
<tr><td colspan="2">Lab</td><td colspan="4"></td></tr>
<tr><td colspan="2">Other</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="5">Requirements (expressed in academic results)</td><td colspan="6">Knowledge
o The student shall summarize 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.</td></tr>
<tr><td colspan="6">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.</td></tr>
<tr><td colspan="6">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.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
Taking responsibility for applying your own work and technical standards</td></tr>
<tr><td colspan="2">Short description of the course content</td><td colspan="6">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</td></tr>
<tr><td colspan="2">Mandatory literature and availability</td><td colspan="6">Literature recommended by the industrial and university consultant</td></tr>
</table>

Quality Management

Subject name	In Hungarian	**Minőségirányítás**				Level	A
	In English	**Quality Management**				Code	DUEN(L)-MUG-117
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 (Weekly)	2	1			F (Practice based)	5	English
Correspondence (Per semester)	10	5					
Teacher responsible for the course		Name		Peter Bajor, PhD		Position	assoc. prof.

Educational goals	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.	
Typical delivery methods	Lecture	In a classroom with the use of projector or computer in each lecture.
	Seminar	Group work and presentations
	Laboratory	-
Requirements	**Knowledge** – Know the structure of national quality system and the philosophy of TQM and its effects on quality managements, on employees and on environment. – 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. – Able to interpret standards and analyse of their text. – Know the requirements of quality management system standard	
	Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to create basic models of technical systems and processes.	
	Attitude - He/She is open to learning about and accepting knowledge related to quality engineering 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	The subject gives a general review of professional relations of building and operation of Quality Management System and about that the design 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.	
Activity forms of students	Processing of heard text with notes 60% Organizing information with a task 10% Independent processing of tasks 30%.	
Compulsory reading and its availability	G. Vorley - F. Tickle: Quality Management - Principles & Practice QM& Training Limited, Guildford, UK ISBN 1 904302 02 5	
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.	

Mechatronics specialisation

Basics of Mechatronics

<table>
<tr><td colspan="2" rowspan="2">Title of subject:</td><td>Hungarian:</td><td colspan="4">Mechatronika alapjai</td><td colspan="2" rowspan="2">Code:</td><td colspan="2" rowspan="2">DUEN(L)-MUG-155</td></tr>
<tr><td>English:</td><td colspan="4">Basics of Mechatronics</td></tr>
<tr><td colspan="12"></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="7">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="5">-</td><td colspan="2">Code:</td><td colspan="2">-</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 (Weekly)</td><td>39</td><td>Week</td><td>2</td><td>Week</td><td>0</td><td>Week</td><td>1</td><td>semester grade</td><td>5</td><td colspan="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><td></td><td></td><td colspan="2"></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 colspan="2">associate professor</td></tr>
<tr><td colspan="3">Purpose of the subject (content, outcome, place in the curriculum)</td><td colspan="8"></td></tr>
<tr><td colspan="3" rowspan="4">Typical lesson types</td><td>Lecture:</td><td colspan="8">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="8">-</td></tr>
<tr><td>Laboratory</td><td colspan="8">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="8">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="8">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="8">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="8">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="3">Compulsory literature</td><td colspan="8">Materials in moodle system.</td></tr>
<tr><td colspan="3">Optional literature</td><td colspan="8">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="8">defined on the first lesson</td></tr>
<tr><td colspan="3">Midterm tests and their timing</td><td colspan="8">2 tests as given in the first lecture, retake in the following week, semester evaluation in the last week.</td></tr>
</table>

Sensors and Actuators

Subject name	In Hungarian	**Szenzorok és aktuátorok**			Level	A
	In English	**Sensors and Actuators**			Code	DUEN(L)-MUG-158
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 (Weekly)	2	0	1	F(practical work)	5	Hungarian
Correspondence (Per semester)	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		ert H. Bishop: The mechatronics handbook, CRC Press LLC, NY Washington, 2002 ISBN: 0-8493-0066-5 id G. Alciatore, Michael B. Histand: Introduction to Mechatronics and Measurement Systems, 4th Ed., Mc Graw Hill, 2012, ISBN: 978-0-07-338023-0 ert H. Bishop: Mechatronics, An introduction, Taylor&Francis, CRC Press, 2006, ISBN: 0-8493-6358-6 frey C. Onwubolu: Mechatronics principles and applications, Elsevier, 2005, ISBN: 0-7506-6379-0 . 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.				

Mechatronics Systems I.

Subject name	In Hungarian	**Mechatronikai rendszerek I.**			Level	A
	In English	**Mechatronics Systems I.**			Code	DUEN(L)-MUG-114
Subject code						
Responsible educational unit		Institute of Engineering				
Name of Mandatory Preliminary Study		DUEN(L)-MUG-211 Introduction to mechatronics				
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	2	0	1	F (Practice based)	5	English
Correspondence (Per semester)	10	0	5			
Teacher responsible for the course	Name		Peter Bajor, PhD		Position	assoc. prof.

Educational goals	Learning the structure and operation of modern automatized systems. The course supports the student's mastery of the main electricity distribution concepts, control applications and electric work safety issues and design. The course supports the interiorization of electric schematics analysis skills, including the power lines and circuits, devices used in distribution, electric motor supply and control. The course presents the most important electricity supply, protection and control concepts and skills for mechanical engineers, and provides an overview of methodologies on system analysis and mechatronics system planning. Throughout the course, case studies and individual learning and design tasks are applied to support the development of analytical, problem solving and communication skills of students.	
Typical delivery methods	Lecture	In a classroom with the use of projector or computer in each lecture.
	Seminar	
	Laboratory	Flipchart, blackboard, mechatronics training toolkit, and other multimedia equipment in smaller seminar rooms suitable for group work
Requirements	**Knowledge** – Can interpret, characterize and model the structure and operation of the structural units and elements of mechatronics systems, the design and relationship of the applied system elements – Understand the basic concepts of the electricity distribution, protection and safety systems – Become familiar with the electrical drawing and P&I schematics reading and design – Understand and identify the elements of electric work safety issues	
	Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to create basic models of technical systems and processes.	
	Attitude - He/She 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.	
	Autonomy and responsibility Taking responsibility for one's own work and the work of others.	
Brief description of the subject content	The interpretation of electricity supply and distribution. Analysis of electrical drawings and P&I schematics. Protecting power lines, electrical circuits and electric machinery at the case of overcurrent and short circuit faults. Fuse. Circuit breaker. Residual current device. Relays and contactors. Overload relay. Thermistor circuit. Safety of electric work. Lighting control. Relay logic. Induction motor control. Variable frequency drive. Process automation design and functions. Lab: Assembly of systems operated by programmable logical controller.	
Activity forms of students	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	Learning materials in the Moodle system and teams (OneDrive)	
Recommended reading and its availability	Petruzella F. D. - 2009 - Electric motors and control systems (https://sovathrothsama.files.wordpress.com/2016/02/electric-motors-and-control-systems.pdf) ABB Switchgear Manual 10th Edition (http://161.53.66.8/shared/PRIRUCNICI-1/ABB%20Pocket%20Books/ABB%20Pocket%20Book%2010th%20edition.pdf) Motor Controls (https://cdn.automationdirect.com/static/catalog/images/product-pdf/MS-Motor-Controls.pdf) Littelfuse – Electrical Safety Hazards Handbook (https://www.lanl.gov/safety/electrical/docs/arc_flash_safety.pdf)	
Hand-in Assignments/ measurement reports	1. Individual assignment: Sample project analysis (Week 7.) 2. Group assignment: Students form groups of 2 or 3 and present the appropriate control strategy for specific mechatronics systems. (Week 12.)	
Description of midterm tests	The goal of the final test is to assess the students' knowledge and comprehensive understanding on the main electricity supply and distribution concepts, tools and devices, safety and control issues related to mechatronics systems (Week 13.)	

Mechatronic Project 1.

<table>
<tr><td colspan="3">Title of subject:</td><td>Hungarian:</td><td colspan="4">Mechatronikai projekt 1.</td><td colspan="2">Code:</td><td>DUEN(L)-MUG-113</td></tr>
<tr><td colspan="3"></td><td>English:</td><td colspan="4">Mechatronic Project 1.</td><td colspan="2"></td><td></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="8">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="6">-</td><td colspan="2">Code:</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="4">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 colspan="2">Lecture</td><td colspan="2">Seminar</td><td colspan="2">Practice/Laboratory</td></tr>
<tr><td>Full-time (Weekly)</td><td>39</td><td>Week</td><td>0</td><td>Week</td><td>1</td><td>Week</td><td>2</td><td>semester grade</td><td>5</td><td>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><td></td><td></td><td></td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td colspan="3">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="8"></td></tr>
<tr><td colspan="3" rowspan="4">Typical lesson types</td><td colspan="2">Lecture:</td><td colspan="7">-</td></tr>
<tr><td colspan="2">Seminar:</td><td colspan="7">Project report and discussion using student’s project documentation or online consultations.</td></tr>
<tr><td colspan="2">Laboratory</td><td colspan="7">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 colspan="2">Other:</td><td colspan="7">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="9">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="9">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="3">Forms of student activity</td><td colspan="9">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="3">Compulsory literature</td><td colspan="9">Materials in moodle system.</td></tr>
<tr><td colspan="3">Optional literature</td><td colspan="9">-</td></tr>
<tr><td colspan="3">Compulsory tasks during semester</td><td colspan="9">Preparation and presentation of a report according to the instructor's instructions.</td></tr>
<tr><td colspan="3">Midterm tests and their timing</td><td colspan="9">-</td></tr>
</table>

Electric Drive Technology

<table>
<tr><td colspan="2" rowspan="2">Title of subject:</td><td>Hungarian:</td><td colspan="6">Villamos hajtástechnika</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-259</td></tr>
<tr><td>English:</td><td colspan="6">Electric Drive Technology</td></tr>
<tr><td colspan="3">Institute:</td><td colspan="6">University of Dunaújváros</td><td></td><td></td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="6">-</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
Lecture</td><td colspan="2" rowspan="2">Seminar</td><td colspan="2" rowspan="2">Practice/Laboratory</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr></tr>
<tr><td>Full-time (Weekly)</td><td>39</td><td>Week</td><td>3</td><td>Week</td><td>0</td><td>Week</td><td>0</td><td>semester grade</td><td>5</td><td>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><td></td><td></td><td></td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td colspan="2">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="8"></td></tr>
<tr><td colspan="3" rowspan="4">Typical lesson types</td><td colspan="2">Lecture:</td><td colspan="7">Lecture with a projector or online course materials (note, lecture student, other), guides to learn or online consultations.</td></tr>
<tr><td colspan="2">Seminar:</td><td colspan="7">-</td></tr>
<tr><td colspan="2">Laboratory</td><td colspan="7">-</td></tr>
<tr><td colspan="2">Other:</td><td colspan="7">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="9">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="3">Short description of subject content</td><td colspan="9">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="3">Forms of student activity</td><td colspan="9">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="3">Compulsory literature</td><td colspan="9">Materials in moodle system.</td></tr>
<tr><td colspan="3">Optional literature</td><td colspan="9">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="3">Compulsory tasks during semester</td><td colspan="9">Defined by the teacher.</td></tr>
<tr><td colspan="3">Midterm tests and their timing</td><td colspan="9">2 tests as given in the first lecture, retake in the following week, semester evaluation in the last week.</td></tr>
</table>

Mechatronics Systems Programming

Subject name	In Hungarian	**Mechatronikai rendszerek programozása**			Level	A
	In English	**Mechatronics Systems Programming**			Code	DUEN(L)-MUG-218
Responsible educational unit		Institute of Engineering				
Name of Mandatory Preliminary Study		DUEN-MUG-155				
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	0	0	3	F (practical work)	5	Hungarian
Correspondence (Per semester)	0	0	10			
Teacher responsible for the course		Name	Dr. Andras Nagy		Position	assoc. prof.
Educational goals		ning the programming of computer-based guide system through solving mechatronic problems.				
Typical delivery methods		Lecture				
		Seminar				
		Laboratory	Laboratory work			
Requirements		**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				
		Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to understand mechatronics systems and programming methods				
		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		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.				
Activity forms of students		Individual work, Frontal class work, Practical programming				
Compulsory reading and its availability		Materials on MOODLE				
Recommended reading and its availability		oduction to LabVIEW (http://www.ni.com/getting-started/labview-basics/)				
Hand-in Assignments/ measurement reports		Solving the programming of a chosen problem (On week 10th)				
Description of midterm tests		N/A				

Mechatronics Systems 2

Subject name	In Hungarian	**Mechatronikai rendszerek 2**				Level	A
	In English	**Mechatronics Systems 2**				Code	DUEN(L)-MUG-258
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 (Weekly)		2	0	1	V (exam)	5	Hungarian
Correspondence (Per semester)		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 . 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.					

Mechatronic Project 2.

<table>
<tr><td colspan="2" rowspan="2">Title of subject:</td><td>Hungarian:</td><td colspan="6">Mechatronikai projekt 2.</td><td rowspan="2">Code:</td><td rowspan="2">DUEN(L)-MUG-217</td></tr>
<tr><td>English:</td><td colspan="6">Mechatronic Project 2.</td></tr>
<tr><td colspan="11"></td></tr>
<tr><td colspan="3">Institute:</td><td colspan="7">University of Dunaújváros</td></tr>
<tr><td colspan="3">Compulsory pre-subject:</td><td colspan="6">-</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
Lecture</td><td colspan="2" rowspan="2">Seminar</td><td colspan="2" rowspan="2">Practice/Laboratory</td><td rowspan="2">Requirements</td><td rowspan="2">Credit</td><td rowspan="2">Language of teaching</td></tr>
<tr></tr>
<tr><td>Full-time (Weekly)</td><td>39</td><td>Week</td><td>0</td><td>Week</td><td>1</td><td>Week</td><td>2</td><td>semester grade</td><td>5</td><td>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><td></td><td></td><td></td></tr>
<tr><td colspan="3">Teacher responsible for the subject</td><td colspan="2">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="8"></td></tr>
<tr><td colspan="3" rowspan="4">Typical lesson types</td><td colspan="2">Lecture:</td><td colspan="7">-</td></tr>
<tr><td colspan="2">Seminar:</td><td colspan="7">Project report and discussion using student’s project documentation or online consultations.</td></tr>
<tr><td colspan="2">Laboratory</td><td colspan="7">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 colspan="2">Other:</td><td colspan="7">-</td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="8">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="8">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="3">Forms of student activity</td><td colspan="8">Understands and interprets written texts.
Information processing.
Individual problem solving, presentation of results.</td></tr>
<tr><td colspan="3">Compulsory literature</td><td colspan="8">Materials in moodle system.</td></tr>
<tr><td colspan="3">Optional literature</td><td colspan="8">-</td></tr>
<tr><td colspan="3">Compulsory tasks during semester</td><td colspan="8">Preparation and presentation of a report according to the instructor's instructions.</td></tr>
<tr><td colspan="3">Midterm tests and their timing</td><td colspan="8">-</td></tr>
</table>

Maintenance specialisation

Production Planning, CAM

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Gyártástervezés, CAM</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="4">Production Planning, CAM</td><td>Code</td><td>DUEN(L)-MUG-111</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-MUG-214, DUEN-MUG-110 Machine structures 1-2.
DUEN-MUG-252 Production technology</td></tr>
<tr><td colspan="2">Number of Lessons</td><td colspan="3" rowspan="2"></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 colspan="2">Full-time (Weekly)</td><td>2</td><td>1</td><td>1</td><td rowspan="2">F (practical mark)</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td colspan="2">Name</td><td colspan="2">Dr. Gabor Vizi</td><td>Position</td><td>assoc. prof.</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">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.</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td>Lecture</td><td colspan="5">In a classroom with using of projector and computer for every students</td></tr>
<tr><td>Seminar</td><td colspan="5">In a classroom with using of PC and simulator software on each practice.</td></tr>
<tr><td>Laboratory</td><td colspan="5">In a classroom with using of PC and simulator software on each practice.</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 CAD aspects.</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 designing 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 personal work and the work with others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="6">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.</td></tr>
<tr><td colspan="2">Activity forms of students</td><td colspan="6">Designing of manufacturing processes of workpieces using simulator software</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">-1. Production Technology, HMT Bangalore, Tata McGraw-Hill Education, 2001, ISBN-13: 978-0-07-096443-3, ISBN-10: 0-07-096443-2
2. Production engineering, K.C. Jain, A. K. Chitale, 2010, PHI learning Private Limited, New Delhi, ISBN-978-81-203-3526-4
3. NCT CNC manuals</td></tr>
<tr><td colspan="2">Hand-in Assignments/ measurement reports</td><td colspan="6">- Individual work regarding problem solving of one part of manufacturing process and fixture designing.</td></tr>
<tr><td colspan="2">Description of midterm tests</td><td colspan="6">One est at 7th week and second test at 11th week</td></tr>
</table>

Tribology

Subject name	In Hungarian	**Tribológia**			Level	A
	In English	**Tribology**			Code	DUEN(L)-MUG-118
Responsible educational unit		Institute of Engineering				
Name of Mandatory Preliminary Study		DUEN(L)-MUG-110 Machine structures 2. DUEN(L)-MUT-250 Thermodynamics and Hydrodynamics				
Number of Lessons					Requirements	Credits (ECTS)	Language of Education
		Lecture	Seminar	Laboratory			
Full-time (Weekly)		2	1		F (practical mark)	5	Hungarian
Correspondence (Per semester)		10	5				
Teacher responsible for the course		Name		Dr. Attila Szabo	Position	assoc. prof.	
Educational goals		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.					
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** – 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					
		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					
		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.					
		Autonomy and responsibility Taking responsibility for one's own work and the work of others.					
Brief description of the subject content		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.					
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		Ramsey Gohar (Imperial College London, UK) & H Rahnejat (Loughborough University, UK): FUNDAMENTALS OF TRIBOLOGY Gwidon Stachowiak and Andrew W. Batchelor : Engineering Tribology, Third Edition Prasanta School					
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 1

Subject name	In Hungarian	**Műszaki Diagnosztika 1.**			Level	A
	In English	**Technical Diagnostics 1**			Code	DUEN(L)-MUG-157
Responsible educational unit		Institute of Engineering				
Name of Mandatory Preliminary Study		DUEN(L)-MUG-211 Introduction to mechatronics				
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	2	1	0	V (Exam)	5	English
Correspondence (Per semester)	10	5	0			
Teacher responsible for the course	Name		Peter Bajor, PhD		Position	assoc. prof.
Educational goals	The objective of the course is the foundation of the up-to -date maintenance technologies and he acquirement of the basics knowledge of theoretical and practical vibration diagnostics of rorating machinery..					
Typical delivery methods	Lecture	In a classroom with the use of projector or computer in each lecture.				
	Seminar	Group work, individual work and presentations				
	Laboratory	-				
Requirements	**Knowledge** – Can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and connection of the applied system elements.					
	Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to create basic models of technical systems and processes.					
	Attitude - He/She 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.					
	Autonomy and responsibility Taking responsibility for one's own work and the work of others.					
Brief description of the subject content	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					
Activity forms of students	Lecture: note-text processing 40%, independent processing of theoretical 20%, problem solving 40%.					
Compulsory 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.					
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.					

Maintenance Technologies 1.

<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">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="2">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 colspan="2"></td><td>Lecture</td><td>Seminar</td><td>Laboratory</td><td>Credits (ECTS)</td><td>Language of Education</td></tr>
<tr><td colspan="2">Full-time (Weekly)</td><td>2</td><td>1</td><td></td><td rowspan="2">CA (Continuous assessment)</td><td rowspan="2">5</td><td rowspan="2">Hungarian</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td>10</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>assoc. prof.</td></tr>
<tr><td colspan="2">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="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
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="2">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="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">-</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>

Maintenance Technologies 2.

Subject name	In Hungarian	**Karbantartási technológiák 2.**			Level	A
	In English	**Maintenance Technologies 2.**			Code	DUEN(L)-MUG-256
Responsible educational unit		Institute of Engineering				
Name of Mandatory Preliminary Study		DUEN(L)-MUG-112 Maintenance technologies 1.				
Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	2	1		Exam	5	Hungarian
Correspondence (Per semester)	10	5				
Teacher responsible for the course	Name	Dr. Attila Szabo			Position	assoc. prof.

Educational goals	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 ntegrity. The economicalness and organisation of machine maintenance. The indexes of economicalness of machine maintenance	
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** Able to analytically examine the damage processes of machines and equipment, to identify the causes of errors and to eliminate them professionally	
	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	
	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.	
	Autonomy and responsibility Taking responsibility for one's own work and the work of others.	
Brief description of the subject content	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.	
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	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	
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.	

Maintenance Planning and Organisation

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Karbantartás tervezése és szervezése</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">Maintenance Planning and Organisation</td><td>Code</td><td>DUEN(L)-MUG-513</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5">-</td></tr>
<tr><td colspan="2">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 colspan="2">Full-time (Weekly)</td><td>2</td><td>1</td><td></td><td rowspan="2">Exam</td><td rowspan="2">5</td><td rowspan="2">Hungarian</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td>10</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>assoc. prof.</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">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.</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
– 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</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.</td></tr>
<tr><td colspan="6">Attitude
Strives to organize and perform its tasks in accordance with the expectations of environmental awareness, health awareness and sustainability</td></tr>
<tr><td colspan="6">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.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="6">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).</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">David J Smith: Reliability, Maintainability and Risk, Elsevier, 2013.
Materials on MOODLE</td></tr>
<tr><td colspan="2">Recommended reading and its availability</td><td colspan="6">-</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 2.

Subject name	In Hungarian	**Műszaki Diagnosztika 2.**		Level	A
	In English	**Technical Diagnostics 2.**		Code	DUEN(L)-MUG-219
Responsible educational unit		Institute of Engineering			
Name of Mandatory Preliminary Study		DUEN(L)-MUG-151 Machinery DUEN(L)-MUG-157 Technical Diagnostics 1			

Number of Lessons				Requirements	Credits (ECTS)	Language of Education
	Lecture	Seminar	Laboratory			
Full-time (Weekly)	2	0	1	F (Practice based)	5	English
Correspondence (Per semester)	10	0	5			

Teacher responsible for the course	Name	Peter Bajor, PhD	Position	assoc. prof.

Educational goals	Know the basics of theory and mathematical description of modern systems used in diagnostics, he 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.	
Typical delivery methods	Lecture	In a classroom with the use of projector or computer in each lecture.
	Seminar	
	Laboratory	Measurements, experiments in laboratory setting
Requirements	**Knowledge** – Can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and connection of the applied system elements.	
	Ability – Performs a job that matches his qualifications. – Able to plan, organize and conduct independent learning. – Able to create basic models of technical systems and processes.	
	Attitude - He/She is open for learning about and accepting knowledge related to machinery diagnostics in 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	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 prepare 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.	
Activity forms of students	Lecture: note-text processing 40%, independent processing of theoretical 20%, problem solving 40%.	
Compulsory 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.	
Recommended reading and its availability	In the Moodle system and Teams (OneDrive)	
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.	

Complex Machine Designing

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Komplex gépészeti tervezés</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">Complex Machine Designing</td><td>Code</td><td>DUEN-MUG-216</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5">DUEN-MUG-214 Machine structures 1-2.
DUEN-MUG-111 Production planning, CAM</td></tr>
<tr><td colspan="2">Number of Lessons</td><td colspan="3" rowspan="2"></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 colspan="2">Full-time (Weekly)</td><td>0</td><td>0</td><td>3</td><td rowspan="2">F (practical mark)</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</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. Gabor Vizi</td><td>Position</td><td>assoc. prof.</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">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.</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td>Lecture</td><td colspan="5">-</td></tr>
<tr><td>Seminar</td><td colspan="5">-</td></tr>
<tr><td>Laboratory</td><td colspan="5">In a classroom with using of projector and computer on each practice.</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 CAD aspects.</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 designing 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 personal work and the work with others.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="6">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.</td></tr>
</table>

Welding

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Hegesztés</td><td>Level</td><td>A</td></tr>
<tr><td>In English</td><td colspan="3">Welding</td><td>Code</td><td>DUEN(L)-MUA-210</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute of Engineering</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5">DFAN(L)-MUA-003 Materials technology.</td></tr>
<tr><td colspan="2">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 colspan="2">Full-time (Weekly)</td><td>1</td><td>1</td><td>1</td><td>F (practical mark)</td><td>5</td><td>English</td></tr>
<tr><td colspan="2">Correspondence (Per semester)</td><td>5</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 colspan="2">Name</td><td colspan="2">Dr. Bela Palotas</td><td>Position</td><td>Prof. emeritus</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">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, labor safety and environmental protection of welding.</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">Demostration and application of welding processes in laboratory.</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 welding aspects.
– Has a comprehensive knowledge of the welding 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 welding 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">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. Labor safety and environmental protection of welding.
Economics of welding and processes selection by environmental protection aspects.</td></tr>
<tr><td colspan="2">Activity forms of students</td><td colspan="6">Processing of theoretical material with control 20 %, independent processing of theoretical material 50 %, Task solving with control 30 %.</td></tr>
<tr><td colspan="2">Compulsory reading and its availability</td><td colspan="6">Materials on MOODLE in www.uniduna.hu</td></tr>
<tr><td colspan="2">Recommended reading and its availability</td><td colspan="6">Welding Handbook, Volume 1, 2, 3 and 4.
American Welding Society, Miami, Fl, The USA, 1991.</td></tr>
<tr><td colspan="2">Hand-in Assignments/ measurement reports</td><td colspan="6">Preparation of welding documentation with control.</td></tr>
<tr><td colspan="2">Description of midterm tests</td><td colspan="6">Midterm tests on weeks 7th and 12th.</td></tr>
</table>

Elective subjects

Business Communication

Subject name		**In Hungarian**		**Üzleti kommunikáció**					Level		A
		In English		**Business Communication**					Code		DUEN(L)-TKM-220
Subject code											
Responsible educational unit				**Institute for Social Sciences Department of Communication and Media**							
Name of Mandatory Preliminary Study											
Number of Lessons								**Requirements**	**Credits (ECTS)**	**Language of Education**	
		Lecture		**Seminar**		**Laboratory**					
Full-time (Weekly)		1		2				CA (Continuous assessment)	5	**English**	
Correspondence (Per semester)	20	5		10							
Teacher responsible for the course				**Name**		Dr. habil István András			**Position**	College Teacher	
Educational goals				The goal of the course is to develop the essential skills required in the field of business. The aim of the course in to famailiarize students with certain communication roles required fulfill managerial roles in an organization, to make students recognize the differences between horizontal and vertical business communication needs. Certain personal development processes will also be discussed during the course (self knowledge, group work, communication of decisions)							
Typical delivery methods				**Lecture**	In a classroom with the use of projector or computer in each lecture.						
				Seminar	In a classroom with the use of projector or computer in each seminar with the application of group work, role play and simulation game.						
				Laboratory							
Requirements (expressed in learning outcomes/competencies to be acquired)				**Knowledge** Students as potential business communicators know: • the types, terminology and main principles of business communication • the steps of effective business communication • how to develop own business skills							
				Ability Students will be able to: • analyse relevant literature • chose and apply the business communication method appropriate for the professional situation define practices that will help the development of own business environment							
				Attitude Good business communicators are patient, well-educated and have empathy, i.e. they can successfully deal with communication issues with the hierarchy of a company Good, future-oriented bargainers respect their counterpart, are trustworthy. • They are open to self development and self criticism.							
				Autonomy and responsibility In professional questions business communicators can play the role of a decision-maker and are able to solve problems alone. They can decide on the steps of usable method and support autonomy of co-workers.							
				The course familiarizes students with the types of business and institutional communication with the key concepts and phrases The course presents students the barriers of successful self-advocacy.							
				Weekly online tests: 20% Frontal work: 30 % Individual or group work: 35% Test: 15%							
				Harvard Business Essentials. Negotiation (2003). Boston/Massachusetts: Harvard Business School Press.							
Brief description of the subject content				• Ramsborg, G (2015) *Professional Meeting Management: A Guide to Meetings, Conventions and Events.* PCMA 6th edition • Streibel, B (2002) *The Manager's Guide to Effective Meeting*. Briecase Book Series							
Activity forms of students				• Home paper, presentations and case study analysis							
Compulsory reading and its availability				Defintion of main terms, multiple choice test and essay witing about a given business communication situation.							
Recommended reading and its availability											
Hand-in Assignments/ measurement reports											
Description of midterm tests											